

BIOLOGICAL WEAPONS:
THE BLACK SHEEP OF THE WEAPONS OF MASS DESTRUCTION
FAMILY

by

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ABSTRACT

In 1969, President Richard Nixon ended the U.S. biological weapons program proclaiming, “massive, unpredictable, and potentially uncontrollable consequences.” Additionally, he added, “our [the United States government] bacteriological programs in the future will be confined to research in biological defense, on techniques of immunization, and on measures on controlling and preventing the spread of disease.”¹ President Nixon understood the dangerous potential weaponizing living organism could have on society and the dilemma in controlling their development. In the subsequent pages, I explore the complex relationship between disease, public health, warfare, bioterrorism and national security. By examining the system of biodefense strategies, the study will highlight the effectiveness of biodefense policies on countering bioterrorism, securing immunity and promoting greater security. The arguments in the research contribute to the greater debate about the designation of bioweapons and their potential threat. The weapons of mass destruction categories include chemical, biological, radiological and nuclear (CBRN) threats. However, many agree that while these threats can cause widespread panic and harm to the public, only nuclear weapons can be classified with causing mass destruction. For that reason, the examination will focus on the apparent threat caused by biological weapons and the issues that complicate their designation as a weapon of mass destruction.

More specifically the examination will progress over several research topics that challenge the effectiveness of current biodefense strategies; explores the potential threat

¹ Nixon, Richard. "Remarks Announcing Decisions on Chemical and Biological Defense Policies and Programs", via The American Presidency Project, November 25, 1969, accessed September 21, 2013. <http://www.presidency.ucsb.edu/ws/index.php?pid=2344>

of bioterrorism; and examines the dangers of defensive medical countermeasures and immunity on vulnerable populations. These topics will assist in providing a clear understanding of the threat biological weapons pose and contribute to the effort for developing strategies to counter their proliferation.

Thesis Advisor Dr. Kathryn Wagner Hill

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Introduction

Today, world health organizations and national health departments are being tested on how well they prepare for, respond to, and recover from natural and man-made public health emergencies. We live in the most technically advanced time and we have never had more understanding of medicine, microbiology, molecular chemistry and advanced research methods. More lifesaving treatments exist today for diseases that used to be death sentences not too long ago. However, with this increase in knowledge a larger threat to public health and national security has emerged. Observing how diseases have impacted human welfare, economic growth and overall national security, it is appropriate that intersections between security and public health are recognized and controlled. Up until 2001 health related issues were not tied to national security strategies. Yet, the threat risk terrorists and rogue states pose in creating wide spread epidemics and pressure on public health systems that could cripple national readiness and overwhelm medical infrastructure, continue to gain greater attention and legitimacy. Budgets and new programs have directly reflected the priorities and strategies to prepare for biological events and it is apparent that from historic pandemics to biological weapons testing the health of a nation is a national security issue.

In the subsequent pages this research progresses over several questions that deal with public health as a national security concern. Chapter One explores biological weapons' unique characteristics that create ambiguity domestically and contradictions internationally. It examines the proliferation of biological agents under the guise of biodefense that can be peaceful and beneficial to society, but have the potential to cause a massive pandemic if mismanaged or acquired by the wrong group or government. Overall the chapter will focus on the relationship between biodefense and its

effectiveness in keeping the nation safe from widespread manmade and natural public health emergencies caused by biological events, such as bioagents used to infect the population or the intentional spread of infectious diseases. It will examine whether or not biodefense strategies are effective in maintaining national security objectives to reduce the risk of biological weapons use? In order to do this, the chapter, defines biodefense and what elements make up a biodefense strategy. Additionally, the analysis will address what constitutes an effective biodefense program and the various measures for determining its efficacy. The chapter includes an examination of the 2001 Anthrax Letter attacks and compares the effectiveness of U.S. biodefense strategies during that time by looking at policy changes in response to potential future biological weapons threats.

Chapter Two will investigate the genesis of how people learned to use illnesses as a tool against enemies and the impact they've had in progressing ideology and organizational strategy. It will address the time we live in where biological weapons are considered a 'weapon of mass destruction' (WMD), where this designation would be better categorized as a 'weapon of mass disruption.' For example, modern medicine has brought about the possibilities to mitigate the impact of a variety of biological agents, and modern-day society has not experienced the impact of a biological weapon with mass destructive possibilities, yet, the WMD designation still holds up. However, the aim of Chapter Two is not to question the designation, but to add specific analysis for explaining why, in some sense, biological weapons are a threat.

The chapter examines whether experts in the field of bioterrorism have convinced the world that the threats from biological weapons pose greater dangers to society than they actually do? Or have governments implemented the correct strategies to monitor,

prevent and deter rogue states and violent non-state actors (VNSA) from pursuing large-scale biological weapons attacks? In an effort to understand these questions, the analysis in Chapter Two seeks to understand the relationship between deadly biological agents and violent terrorist organizations and how this dangerous couple became one of the most leading national security threats post-WWII according to intelligence officers, high-ranking officials, and experts. Therefore, the question to why the United States has not experienced a large scale, biological weapons attack by a non-state actor in the post WWII era will be answered?

In order to address this question, the chapter will examine various themes on technological advancements in biotechnology and the methods of operation and organizational structure of terrorist groups. More specifically, it will apply; revolutionary versus evolutionary based narratives on the threats posed by biological agents; second, it uses this information to examine technology's influence on terrorist organizations' weapons choice; lastly, the chapter compares terrorist organization structure and terrorists' method of operation to create a concise profile of the most likely bioterrorist. By synthesizing this information, a concise model for explaining why non-state actors have not used biological weapons in a large-scale attack can be determined.

Chapter Three, will explore the intersections of biological warfare and immunity by looking at the historic introduction of disease and how the lack of immunity has shaped the geopolitical world and determined the strength of nations. It will focus on how immunity has changed societies and sometimes provided unintentional strategic positioning. For many societies building immunity and fighting infectious diseases was as valuable as gaining territory or advancing technologically in defense strategies and

weaponry. For example, the Spanish successful conquest over the Aztecs and Incas can be attributed to the Spanish conquistador's immunity to smallpox and measles. These illnesses had a major physical and psychological effect on the indigenous populations in the Americas. This event led to the eventual Spanish dominance on the continent. The unintentional consequence of the Spanish conquistadors' immunity led to the subjugation and downfall of the ancient Inca and Aztec civilizations in less than three years. However, had the Spanish not dealt with these diseases previously in Spain then history would have told a different story.

Chapter three draws on the experiences of historical pandemics and colonial epidemics and noting the role disease and immunity has played in the intentional or unintentional strategic advantage of one society over another, the study will examine how efforts to develop immunity to diseases advances national or international security or insecurity and to what degree. It will also examine whether or not immunity to virulent, communicable diseases can be used as a passive weapon of mass casualty and disruption to further power and influence.

In order to properly examine the question as to whether or not efforts to develop immunity to diseases advances national or international security and to what degree can immunity become a weapon of mass casualty and destruction? The implications of a healthy population have to be linked to the security of a nation. Such as, public health needs to be recognized as an implicit component of national security or otherwise there is no reason to discuss public safety, disease surveillance, and any national system geared toward contributing to the well-being of the populace.

The final section of this examination will recap the analysis across the chapters. It will draw on the findings and conclusions of each case study to facilitate a grand understanding of biosecurity and biosafety in the United States and in the international community. Additionally, the final section will reiterate the key recommendations concluded in each chapter. These recommendations are based on the various case studies highlighted in each chapter to support the overarching hypothesis.

The subsequent pages will frame and organize thoughts and literature surrounding the efficacy of biodefense policies and practices. They will provide historical context as well as provide an understanding of the various arguments in the field of biodefense, biosurveillance and biosecurity. Their ultimate goal is to assist in unravelling the complex issues dealing with the convergence of technology, public health and national security in order to address one of the largest security concerns; bioweapons.

CHAPTER ONE:

Examining the Effectiveness of Biodefense Strategies Post 9/11

Introduction

Biological weapons possess unique characteristics that create ambiguity domestically and contradictions internationally. Unlike any weapon known to conflict or diplomacy, biological weapons can be masked by altruistic intentions and dual-use justification. Their proliferation under the guise of biodefense can be deemed peaceful and beneficial to society, but have the potential to cause a massive pandemic if mismanaged or acquired by the wrong group or government. They can be produced secretly and used without discernible or traceable origins mitigating political blowback and accountability. Biological weapons can be disguised as a bottle of perfume in carry-on luggage or disseminated by a cough or sneeze among world leaders at a G8 meeting. Additionally, terrorist organizations can acquire the basic tool and understanding to produce them with no more than an EBay account, google and limited financial resources. The threats these weapons produce are endless, non-discriminating and evolving. Former U.S. Secretary of State, Hillary Clinton at the Seventh Biological and Toxin Weapons Convention Review Conference noted, “we [the United States] view the risk of a bioweapons attack as both a serious national security challenge and a foreign policy priority... bioweapons are a transnational threat, and therefore we must protect against them with transnational action.” This statement by Clinton acknowledges the dangers that biological weapons pose on the public throughout the world and the need for states to protect against their use. However, she also acknowledges the unique security challenges bioweapons pose.

This paper will focus on the relationship between biodefense policy and strategies and their effectiveness on national security and international non-proliferation efforts. Specifically, it will answer whether or not biodefense strategies are effective in maintaining national security objectives and reducing the risk of biological weapons use and proliferation? In order to do this, however, it is important to first define biodefense and what elements make up a biodefense strategy. Additionally, the analysis will address what constitutes an effective biodefense program and the various measures for determining its efficacy. It will also include an examination of the 2001 Anthrax Letter attacks and examine the effectiveness of U.S. biodefense strategies during that time and look at policy changes in response to potential future biological weapons threats.

Literature Review

Monitoring and Detection

In his book *American Biodefense: How Dangerous Ideas about Biological Weapons Shape National Security*, Frank L. Smith III, argues that the lack of military support and the increase in civilian sponsorship of biodefense is consequential and counterintuitive. Smith bases his argument on the idea that civilian sponsorship of biodefense perpetuates biological weapon stereotypes that are counter the role biodefense plays in national security. He is a strong advocate for the militarization of medical countermeasures over the socially constructed relationship between public health and civilian biodefense.

A large part of biodefense is being ready for a biological incident or emergency. Monitoring people and events and detecting bio-agents early can take place in several areas of biodefense from monitoring scientists in a lab to early outbreak identification.

Many scholars advocate for more intelligence collection by increasing clandestine activities in order to identify violations of biological weapons agreements.² Other experts suggest developing robust biosurveillance systems and databases to track pathogens. The expansion of monitoring and detection is where the challenges of biodefense meet the challenges of public health.³ This section will focus on several of these challenges including, situational awareness, biosurveillance, and private and public coordination efforts.

In 1984, a small religious group in Oregon poisoned 751 people in a small town by infecting salad bars with *Salmonella typhimurium* to sway local election results. The common occurrence of salmonella poisoning from contaminated foods allowed the religious group to get away with their bio-attack for two years, until a former member confessed to authorities what the group had done.⁴ This case is a prime example of the insecurity caused by not having adequate monitoring and detection strategies within biodefense. The religious group was able to buy dangerous pathogens, including the *Salmonella typhimurium* bacteria that had poisoned 751 people because they registered as a medical corporation. This scenario could possibly be repeated due to the lack of monitoring mechanisms specifically, the sale of deadly pathogens and the lack of bio-surveillance. In 2007, the U.S. government through the Department of Homeland Security created the National Biosurveillance Integration Center (NBIC). The mission of NBIC is to rapidly identify, characterize, and track any biological event of national concern that may impact human, animal, plant, or water health. The NBIC works to consolidate information from federal, state, local and commercial sources to better

² Guillemin 2005

³ Schneider 2004

⁴ Miller, Engelberg & Broad 2001, 30-32

monitor activities and make informed decisions on potential bio threats.⁵ For example, according to the Center for Disease Control (CDC), there were eight different events in the U.S. involving different strands of salmonella bacteria. However, it provides a great case for developing more efficient monitoring and detection.

Awareness

Many field experts recommend improving syndrome and public health surveillance.⁶ They also suggest starting bio-threat awareness with our hospitals and doctors through workforce training and disease identification.⁷ During a random test administered to 17 of Pennsylvania's Allegheny County's doctors only two were able to match the correct symptoms to smallpox. Additionally, an emergency physician in the state of Maryland said that patients would need to be displaying the most severe symptoms of anthrax before he or his staff could diagnose them.⁸ Our current system relies heavily on first responders to identify a biological attack by recognizing symptoms and reporting their findings. However, the problems with this type of passive surveillance are they become inaccurate, timely, and limited in coverage. It requires constant training and still there are no guarantees against human error.⁹ During times of disaster and public health emergencies the nation relies on more than 200,000 Medical Reserve Corps (MRC) volunteers to support local, state and territorial jurisdictions.¹⁰ However, a survey of 837 MRC volunteers on optional and mandatory training showed

⁵ National Biosurveillance Integration Center, U.S. Department of Homeland Security.
<http://www.dhs.gov/national-biosurveillance-integration-center>

⁶ Koblenz 2009, 232

⁷ Schneider 2004, 37

⁸ Bartlett 1999, 563

⁹ Schneider 2004, 37

¹⁰ Stronger together: The 2013 Network profile of the MRC, p11
<http://www.naccho.org/topics/emergency/MRC/upload/TTC-NACCHO-MRC-Report-2013-lo-res.pdf>

that less than 50 percent of volunteers participated in training for pandemic planning. Additionally, less than 30 percent have participated in disease detection and screening.¹¹ In Dallas, Texas on September 24th 2014, an individual that just arrived from Ebola ridden Liberia reported to a hospital with common symptoms of the Ebola virus and was sent home after seeing a doctor. The same individual returned to the hospital after his symptoms had worsened and was put into an isolation unit because he tested positive for with the Ebola virus. Because the doctor was not trained on the symptoms and epidemiological procedures, he risked putting others in harm's way and potentially creating a larger outbreak of Ebola in the area.¹² Public health workers have to be aware of potential threats as well as foreign possibilities. Much like in the Oregon case where the genesis of the problem was masked by an unsanitary restaurant, a highly contagious disease like smallpox could infect a huge population before public health officials are even aware of a problem if they are not trained properly. Additionally, any biological weapons attack is most likely to target the civilian population.¹³ Therefore, the public must be aware of symptoms caused by the most deadly bio-agents through public service announcements from radio and television nationally and not limited to areas where we generally think an attack or incident would happen.

¹¹ Ibid. p.22

¹² Khazan, Olga, The Texas Ebola Patient Has Died.

<http://www.theatlantic.com/health/archive/2014/10/the-texas-ebola-patient-has-died/381236/>

¹³ According to the information found in Figure.2, known uses of biological weapons have been used on civilian populations. With the exception of the Sverdlovsk anthrax case that was accidental. From these historical cases the assumption is made that the most likely target for any effective and mass casualty attack with biological weapons is a large civilian population.

Figure 2. Known Biological Weapons Incidents

DATE	LOCATION	ATTACKER	AGENT	AFFECTED POP	CASUALTIES
18 Sep - 9 Oct 2001	United States-- Washington, DC, New York City, NY, others	Bruce Ivins?	anthrax	government and civilian media individuals; postal employees and customer	5 killed , 17 injured
9 - 19 Sep 1984	Oregon, United States	Bhadwan Shree Rajneesh cult	salmonella	civilian restaurants	751 injured
Apr-79	suburbs southeast of Sverdlovsk, USSR	accidental	anthrax	civilians	68 killed , 300 injured
1940 – 1942	China--11 cities	Japanese military	cholera, other bioagents	cities	2,400 killed , 10,000 injured
1932 – 1945	Ping Fan, Manchuria	Japanese military	multiple biological agents	prisoners	1,000 killed , 2,000 injured

Source: modified by author from Robert Johnston's *Summary of Historical Attacks using Chemical or Biological Weapons*, Oct.2014

Surveillance

There are various opportunities for surveillance. Laboratory surveillance is one obvious location to implement surveillance strategies. As the biodefense industry grows and more private labs fight for government contracts and grants to research and develop medical countermeasures, more monitoring will be required. In 2002, in response to a heightened awareness to biological threats after the 2001 Anthrax Letter attacks, the CDC was given \$9 billion to fund Public Health Emergency Preparedness. As part of this preparedness funding, eight performance measures associated with laboratory safety were instituted as major indicators of lab safety and security. These indicators dealt mainly

with reporting, communications, samples management, testing, surge capacity, and response. However, many private labs are out to make money and many scientists just want to practice science. Furthermore, many grant programs rely on self-reporting data, meaning the lab and lab's administrators may report in the affirmative on procedures that they are not compliant with in hopes to win contracts or retain grant funding. Yet, governments prefer labs maintain high levels of employment for laboratory scientists due to their potential contributions to explicit activities. Therefore, there is an emphasis on keeping bioresearch scientists employed so they're not offered opportunities to develop biological weapons for rogue states, terror organizations, or contribute to the illicit drug trade. Much like in 1997, South Africa uncovered an illicit drug trafficking cartel, operated by the former head of South Africa's apartheid-era biological weapons program.¹⁴ This is in no way the norm, however, this particular scenario illustrates a need for strict monitoring and surveillance of scientists trusted with national security.

Currently, the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 requires that the U.S. Department of Health and Human Services and Department of Agriculture to, regulate safety training and security of laboratories handling bio-agents; register labs and individuals with access; develop a "fingerprinting" catalog of all bio-agents in the lab; create a restricted persons list; conduct periodic inspections of inventory.¹⁵ Yet, these requirements refer to labs that are not active in secret biodefense research, which should also be subject to these types of surveillance requirements. However, many suggest that these requirements are expensive and difficult to institute at smaller laboratories. For example, public universities using

¹⁴ Koblentz 2009, 106

¹⁵ Klotz, Sylvester 1999, 1647

volunteer graduate students to assist in research can't afford to sponsor clearances, nor do they have the time to wait for graduate students to clear a thorough background check.

Other barriers to surveillance strategies are the inability of local, state and federal governments to streamline the process of biosurveillance. Cuts in budgets have halted a lot of progress made in health information systems that have been used to streamline a more efficient disease monitoring system, increasing the effectiveness of rapid response. These types of systems proved their worth during the 2009 H1N1 influenza epidemic, where these systems assisted in explaining how the disease was spreading, but more importantly, how to stop the spread of the disease. Specifically, the Real Time Immunization Monitoring System (RTIMS) monitored school children (K-12) and healthcare workers and reported adverse events and provided rapid response to individuals reporting serious symptoms.¹⁶ Additionally, integration and international collaboration on disease and outbreak surveillance is crucial in today's global society. Yet, communication, data sharing, and epidemic intelligence is still far from being a beneficial system to securing public health from emergencies. Whether naturally occurring or intentionally inflicted, these systems are necessary for meeting national security objectives.

Coordination

As mentioned previously, there is general consensus on surveillance as the primary method for effective detection. Additionally, effective surveillance of known and dangerous bio-agents is necessary in order to be categorized and shared nationally with local, state and federal public health officials. In 1998, a bio-fingerprinting system

¹⁶ Federal Plans to Monitor... <http://www.flu.gov/planning-preparedness/federal/fed-plan-to-mon-h1n1-imm-safety.pdf>

called PulseNet was created to assist in detecting a bioterrorism attack by allowing public health officials to share information nationally. Schneider suggests that if the United States is going to have a sustainable biodefense program that emphasizes preparedness then the training needs to be coordinated at local and state level institutions, nursing programs, and medical schools-- with the federal government writing the rules and regulations. He also recommends that first responders get certified and recertified annually and that the federal government standardizes any surveillance and detection criteria.¹⁷ In addition to national coordination, international coordination should also be considered as an important way to effectively utilize biodefense strategies. Koblentz and Preston call for greater coordination internationally and calls on the United States to work with allies to secure transparency and biodefense efforts to respond to epidemics.¹⁸ Since, a highly contagious epidemic knows no borders, it is important to have international cooperation and information sharing to mitigate the impact of diseases. For example, avian flu (H5N1) created a threat for eight years from 1997 to 2005 with 16 outbreaks in the United States with cases stemming from Asia, Africa, Europe and the Near East. It took the coordination of the World Health Organization and local health departments to monitor and eventually contain the virus. According to the CDC, H5N1 is known to have been a low pathogenic outbreak and yet it took public health officials a large effort to contain it. It is more difficult to think of this threat in terms of a high pathogenic outbreak that infects people quickly with a high mortality rate, the resulting damage would be catastrophic.

¹⁷ Schneider, 2004, 43-44

¹⁸ Koblentz, P2reston 2009, 234; 2007, 258

Expanding biodefense through monitoring and detection efforts is backed by a lot of general consensus and common recommendations to increase public awareness, develop greater surveillance mechanisms, and promote greater national and international coordination. Monitoring and detection strategies are the most effective in keeping us safe. Being one step ahead of an outbreak by knowing its treatment and its contagion pattern is a purely defensive mechanism. In addition, monitoring research and development creates the necessary checks and balances that allow officials to prevent or mitigate any attempts by rogue scientists to use deadly pathogens from sponsored labs.

Physical Protection

The physical protection strategies of biodefense expansion are preventative in theory, but are more applicable to safeguarding against an attack that is or will take place and epitomizes defensive strategy. They are not truly preventative because they do not stop an attack before it takes place. The Aum Shinrikyo attacks on Tokyo's subway illustrated the impact biological weapons can have in a crowded and confined space. There is not a lot of literature dealing with the necessary physical infrastructure needed to completely protect against a bioweapons attack. However, Koblentz suggests the best physical protections are filtration systems in buildings and vehicles.¹⁹ In this section, I will discuss the various forms of physical protection, specifically, private infrastructure, public infrastructure, and emergency medical equipment. Private infrastructure refers to mainly private investment in creating new building standards that would take into account bioterror events or safeguarding against wide spread epidemics. More specifically, various trade groups can encourage members to set standards to retrofit large office or residential buildings with High Efficiency Particulate Air filters and positive

¹⁹ Koblentz, (2009, 30)

pressure systems. Public infrastructure on the other hand, will focus on government actions to protect critical infrastructure and utilities. Finally, equipment refers to various articles the public can utilize to protect themselves from bio-agents contamination, much like the Community Fallout Program of the 1960s, during the Cold War.

Private Infrastructure

Imagine for a moment a terrorist organization puts weapons grade anthrax powder in several air supply systems in various skyscrapers in New York, Chicago, and Los Angeles the impact would be catastrophic not only in the targeted buildings , but psychologically the country would come to a standstill. For example, after the planes flew into the World Trade Center towers, planes were grounded for two days throughout the country and the world, which triggered various economic impacts to small businesses, employment, and overall national productivity.²⁰ Today, buildings must meet a certain level of safety; including, fire protection, structural standards, earthquake, etc. However, there is little concern or incentive for the private market to front the upfront cost to improve building air quality and protecting against possible airborne pathogens. These types of improvements to building codes must happen at a policy level before private companies and trade associations endorse them. One way the government can incentivize a program like this is by providing tax credits for companies that upgrade ventilation systems, much like energy standards and tax incentive programs work.

In 2005, the Center for Biosecurity of the University of Pittsburgh Medical Center conducted a working group to address the issue of reducing the risk of biological weapons attacks on buildings through ventilation, filtration, and air conditioning systems. Their recommendations were low cost and effective. They claim that most commercial

²⁰ Makinen, Gail. Economic Effects of 9/11: A Retrospective Assessment.

buildings use filters with a Minimum Efficiency Reporting Value (MERV) of 5 to 8. MERV values range from 1 to 20 with a higher value being a more efficient filter. The working group's main recommendation suggests commercial building replace their current filter with HEPA filters with a MERV from 17 to 20.²¹ This method could be used in every building as well as private homes to protect against a potential, massive attack where a warhead is used to spread airborne pathogens in a densely populated city or a lone wolf terrorist acting with a homemade aerosolized bio-agent.

Retrofitting buildings and possibly vehicles with HEPA filters could potentially save many lives, but hesitation from industry leaders is also valid. There are multiple ways a biological weapon could be disseminated and there are no guarantees that filters would mitigate that threat. However, the price of inaction or not doing something may in the long run be the worst strategy and most costly.

Public Infrastructure

The Colorado River Aqueduct is one of the primary sources of drinking water for Southern California. The opportunity for bioterrorists to contaminate and potentially wipe out 22 million people and economically cripple the seventh largest economy in the world is a possibility. Developing a sensory system that can monitor various bio-agents in the water supply could protect millions. In addition, after the 2001 anthrax letters, all mail sent to congressional offices is re-routed for processing at an off-site facility where mail is scanned with ultraviolet light and opened to protect against any copycat attempts to send dangerous bioagents through the postal service to lawmakers. 2004's budget allocated \$40 million for biosensors in densely populated cities. Investments to public health facilities and reporting systems also received \$50 million to combat bioterrorism.

²¹ Hitchcock et al. 2006

Equipment

During the Cold War large public ad campaigns educated the public on what they would need to be prepared for a nuclear war. The National Fallout Shelter Program was promoted in 1960 to help people get the necessary supplies.²² Today many states encourage individuals, families and communities to have emergency plans, which include various items that are necessary in cases of a national emergency. Organized by the Federal Emergency Management Agency (FEMA) and the Office of the Assistant Secretary for Preparedness and Response (ASPR) these programs focus on communication and in times of extreme emergency public coordination of emergency medical equipment (EME) or personal protection equipment (PPE). Many programs rely on the public to stock and utilize private companies to acquire non-pharmaceutical medical equipment PPEs such as, medical facemasks, rubber gloves, sanitizers, etc. Other PPE might be as simple as plastic sheeting and duct tape to seal windows and doors. In addition to facemasks and a contaminate jumpsuit to mitigate exposure to any viruses buying HEPA filters can minimize exposure to airborne pathogens. Any equipment that the public can buy to protect themselves is a form of physical protection. Food and water supplies are also important pieces of equipment.

In order to promote true defensive measures against biological weapons, the government could develop a packet to distribute with various kinds of information from bio-agents and what they do to how to seal up a house. In addition, they should have facemasks and jumpsuits, plus other various items needed to weather a biological pandemic. Their distribution would be fairly low cost and easily executed. According to the FY2014 budget, civilian biodefense funding reached nearly \$7 billion, where \$6

²² "Civil Defense Shelter Statement." Bulletin Of The Atomic Scientists 18, no. 2 (February 1962): 25

billion was allocated to “multiple use funding” with no allocation to specific programs or research.²³ However, the funding allocation does not favor non-pharmaceutical medical equipment, but favors MCM development and biodefense research. For example, Project BioShield, a project to increase MCM development and testing received an increase of \$250 million, where Hospital Preparedness Program, a program to assist in workforce development and training saw a decrease in \$122.5 million from FY2013 levels.²⁴

Physical protection through improvements to public, private infrastructure and government supplied safety packets could save many lives and allow for citizens to play an active role in mitigating a biological threat. These methods as a form of biodefense are safe and defensive, opposed to offensive and possibly pre-emptive. It would a more favorable practice for the government to invest in safer biological PPEs or non-pharmaceutical medical interventions, rather than developing deadly pathogens or unnecessary MCMs. The risk of one of the pathogens leaking and ending up in the wrong hands or infecting a laboratory worker, is far worse than having an abundance of PPE items.

Research and Development

Research and Development in biodefense consists of creating and using viruses and bacteria, testing their effects, and finding a way to counter them. Additionally, it also involves learning how these biological agents can be used to inflict harm on society, which means testing various methods for weaponizing and disseminating them, this process is formally known as research, development, testing and evaluation (RDT&E). However, as states prepare to stay ahead of biological weapons threats by developing

²³ Sell and Watson, p.200

²⁴ Ibid. p202

deadly strains of viruses and then anti-viral counters, many argue these efforts make us less safe and are the antithesis of any non-proliferation agreement.²⁵ Yet, others suggest that the ultimate safeguard against bioterrorism is knowing and understanding how biological agents will impact society and how to prevent an epidemic by expanding biodefense.²⁶ However, both may be true it is important to understand the relationship between these two opposing views. This section will explore the various ideas on whether or not research and development by way of MCM result in greater biological weapons insecurity, by first exploring the pros and cons of the “dual-use” dilemma of bioresearch, specifically addressing the argument of proliferation or prevention based on states’ motivations and third, the obstacles of verification and compliance with research and developing medical countermeasures.

Proliferation or Prevention

In the tenth article of the Biological Weapons Convention (BWC) states that are part the convention have the right to research and develop biological agents for peaceful purposes. This unique provision is due to the “dual-use” benefits biological research has. Dual-use refers to the societal benefits biological research has for finding cures and treatments to illness on one hand and it ability to create epidemics and weaponize viruses on the other. For example, smallpox or the variola virus is still a highly contagious virus that can cause catastrophic death and disruption to public health systems and it was also one of the first viruses used as a weapon by the British against Native Americans. Although, bioresearch has given us a vaccine and the World Health Organization announced the eradication of smallpox in 1980, the virus lives on in two secure labs. In

²⁵ Guillemin 2005; Klotz,Sylvester 2009; Preston 2007

²⁶ Koblentz 2009; Schneider 2004; Miller,Engelberg,Broad 2001

1993, 1995, 1999, and 2002 the World Health Organization recommended the virus to be destroyed, but one view prevailed; the virus is beneficial to research and acts as a counter to bioterrorism.²⁷

Klotz and Sylvester assert that the dual-use designation by the bioresearch community is an opportunity to make medicine into better bioweapons.²⁸ The National Research Council wrote a report titled, “Biotechnology Research in an Age of Terrorism: Confronting the Dual-Use Dilemma,” which listed “experiments of concern.” These experiments included: creating drug resistant viruses, and ineffective vaccines, enhancing the virulence of a pathogen, or create a pathogen that could go undetected. These experiments are justified under the defensive dual use designation, which contributes to the view that biodefense encourages bioweapons proliferation making us less secure.²⁹ The dual-use dilemma generally concerns itself with how the development and research of deadly bio-agents will impact human health; this is a very obvious dilemma. Yet, many ethical problems such as, right to life, animal rights, freedom of inquiry, human rights, and principles of utility and justice all contribute to this dilemma.

The duality of biodefense medical countermeasures complicates non-proliferation efforts when uncooperative or rogue states claim bioresearch programs are for peaceful and defensive purposes. North Korea and Iraq, for example, were suspected of storing the deadly smallpox virus and vaccinating their soldiers; this kind of action can signal that these countries plan to weaponize and use smallpox in combat and they are taking steps to protect their soldiers.³⁰ Yet, this perception is similar to the United States

²⁷ Schneider 2004, 96-98

²⁸ Klotz and Sylvester, 2009, 1706

²⁹ Guillemin 2005, 18

³⁰ Schneider 2004, 99

vaccinating soldiers against anthrax before leaving for Korea or the Persian Gulf.³¹

Thomas Preston claims that what is “offensive” or “defensive” in bioresearch is more about the intentions and motivations of the scientists and not the actual work being performed.³² In other words, the development of MCM is proliferation regardless of the preventative or defensive nature of the end product. Similarly, Preston notes that the United States government would view their own program as being defensive and would be highly suspicious of it if it were being conducted by the Chinese, North Koreans or Iranians.³³ Yet, Gregory Koblentz, an advocate for increasing biodefense programs admits that in order to conduct meaningful research, development, testing and evaluation on defensive strategy, a program has to have an offensive component to determine the defensive countermeasures. He also admits, there is a lot of “grey area” on what is permissible under the Biological Weapons Convention regarding a legitimate biological weapons biodefense program.³⁴

Jeanne Guillemin suggests that biological weapons proliferation may be greater now than during any other time due to advances in biotechnology. She also asserts that proliferation and use is inevitable and calls for greater international restraints. However, these restraints are easily evaded due to the ease to which states can hide their bioweapons programs and claim offensive research for defensive purposes. Yet, how are programs supposed to be legitimized as defensive if they are kept secret? The Biological

³¹ Schneider 2004, 70

³² Preston 2007, 184

³³ Preston 2007, 185

³⁴ Koblentz 2009, 69

Weapons Convention requires signatories to declare legitimate defensive programs, but it is the illegitimate programs that remain secret and pose a problem.³⁵

Biodefense medical countermeasures produce complicated “grey” areas for verifying legitimate defensive programs and maintaining genuine compliance with non-proliferations agreements. The dual-use characteristics make it easy for states to hide their intentions and motivations by engaging in “defensive” RDT&E, which make compliance easy to claim. However, declared and apparent biodefense programs operate under a level of secrecy in order to preserve their defensive strategy. Koblentz suggests, “the premium for secrecy arises from the availability of medical countermeasures against specific biological agents and the potential for an adversary to create new medical countermeasures.”³⁶ How is it then possible for non-proliferation agreements to provide a viable level of verification? In addition, to dual-use and secrecy, biodefense programs do not take up large sites like nuclear facilities do and can be disguised as a farm, a factory, or completely underground and out of site, which create further barriers in verification.

In 2001, the United States sealed the fate of any real verification and compliance protocols in the BWC by withdrawing from binding provisions. Since then the BWC has failed to develop or agree on verification and compliance mechanisms. However, verification and compliance has hurdles without considering the dual-use dilemma: 1) there needs to be criteria on permitted activity; 2) quantity levels of a bio-agent need to be set; 3) export controls should be agreed on; 4) the use for each bio-agent to be declared; 5) a clear definition of what a biological weapon is needs to be decided on.

³⁵ Guillemin 2005, 188

³⁶ Koblentz 2009, 108

Without overcoming these hurdles verification and compliance will remain unresolved.³⁷

Additionally, none of the above actions can guarantee that biological weapons cannot find their way into the wrong hands, but they could possibly decrease the chances of highly sophisticated bioweapons from being stolen and used.

Dual-use, proliferation, and verification and compliance can all contribute to a multiplied threat caused by biodefense medical countermeasures. However, the view of biodefense expansion contributing, as a threat multiplier is not shared by all and this paper will further elaborate on the effectiveness of biodefense as it relates to insecurity.

Biodefense as an effective security strategy?

The previous sections have outlined what factors make up biodefense and provide a clear framework on the challenges and opportunities posed by biodefense expansion. With the increase in technology and bioresearch comes the opportunity to find cures for some of the most pressing public health problems. Additionally, vaccines and medical countermeasures for some of the most dangerous viruses can be made. However, does biodefense keep us safe or does it encourage bioweapons proliferation? The next section will analyze the biodefense program in the United States during the 2001 Anthrax Letters. By using the criteria previously outlined, it will examine whether or not biodefense efforts created vulnerabilities in keeping the public safe and whether the strategies employed were effective. Based on the previous analysis of biodefense strategies, current biodefense expansion has caused difficulty in monitoring and compliance. The dual-use characteristic of bioresearch has made us less safe, encouraging states to develop secret biological weapons programs without the normal oversights and protections.

³⁷ Chevrier 1995

Methodology

In order to examine whether or not biodefense strategies are effective in maintaining national security objectives and reducing the risk of biological weapons use and proliferation, the paper will dissect biodefense spending and strategies post 9/11. In his 2004 Presidential Directive-10, “Biodefense for the 21st Century,” then President George W. Bush outlined the future of U.S. biodefense strategy. Directive 10 focused on four essential pillars, namely; threat awareness, prevention and protection, surveillance and detection, and response and recovery.³⁸ These pillars have remained a consistent framework for U.S. biodefense policy. However, funding and allocation of resources has determined the focus and priorities of administrations and U.S. policy.³⁹

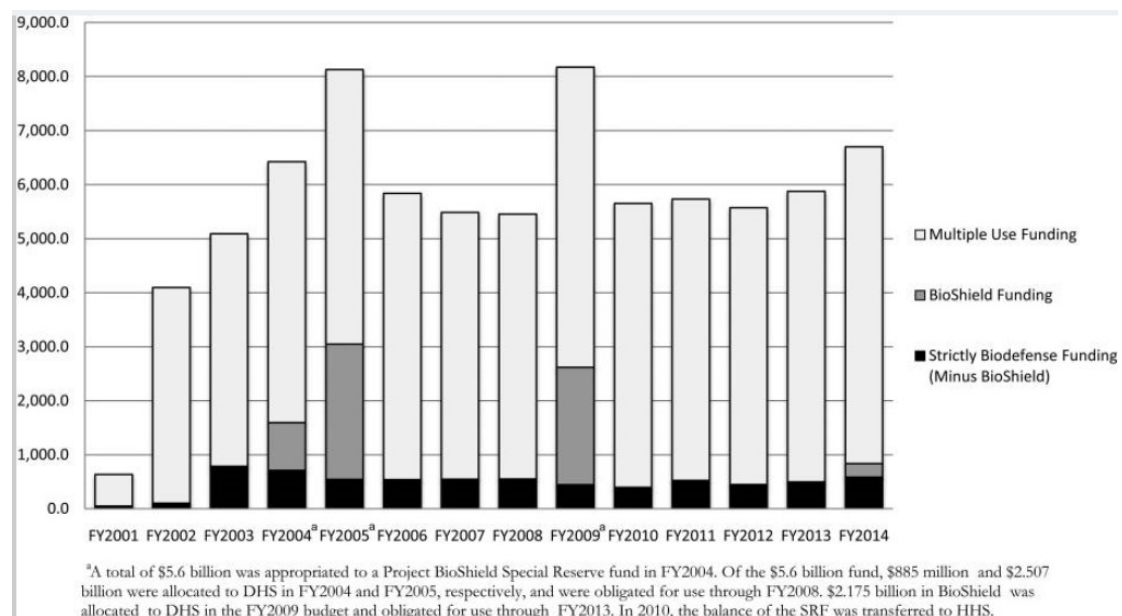
Biodefense spending in the United States pre-September 11, 2001 and pre-Anthrax Letters shows a very significant gap when compared to after 2001. Following the flow of money allows for an accurate look into the priorities of top government administrators and departments. After the 2001 Anthrax Letters, the Bush administration requested emergency funding of \$1.5 billion for countering bioterrorism, which the congress increased to \$2.5 billion. Biodefense saw a 1,500 percent increase from 2001 to

³⁸ The Executive Office of the President, “Biodefense for the 21st Century,” Homeland Security Presidential Directive 10/HSPD-10, April 28, 2004.

³⁹ Conflicting views of bioterrorism and the breadth of the federal biodefense effort, which crosses congressional committee, complicates congressional oversight of the overall biodefense enterprise. Between G.W.Bush and Barrack Obama several Presidential Executive Orders and Directives have been issued to sort out the biodefense responsibilities across the U.S. government. Related directives and executive orders are: Executive Order 13527, “Establishing Federal Capability for the Timely Provision of Medical Countermeasures Following a Biological Attack,” 75 *Federal Register* 737-738, January 6, 2010; National Security Council, Executive Office of the President, *National Strategy for Countering Biological Threats*, November 2009 and Office of the Press Secretary, The White House, “Executive Order—Optimizing the Security of Biological Select Agents and Toxins in the United States,” July 2, 2010. The federal government has also tested its capabilities through exercises responding to bioterrorism.

2006.⁴⁰ By tracking which government agencies received the larger portions of funding one can also assume what type of biodefense strategy the government was interested in employing. Although, spending does not correlate to effectiveness it can indicate methods to prevent, detect, mitigate and treat.

Figure 1. Civilian Biodefense Funding by Fiscal Year, FY2001-FY2014 (in \$millions)



Source: Tara Kirk Sell and Matthew Watson. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science.

In Figure 1, biodefense funding refers to programs that are entirely funded for prevention, preparedness, and the mitigation of deliberate biological threats. However, multiuse funding is still funding designated for biodefense, but is categorized as areas that improve biodefense by contributing to science, public health, healthcare, and national

⁴⁰ Tara Kirk Sell and Matthew Watson. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science. September 2013, 11(3): p.200-203

security.⁴¹ Literature suggests biodefense includes methods to prevent, detect, mitigate, and treat incidents of biological weapons use. Prevention consists of efforts that will limit or deter the use and impacts of a biological agent and control its ability to inflict mass chaos, death or cause widespread psychological damages. These preventative measures usually consist of intelligence collection, biosurveillance, built infrastructure, health workforce training and public health improvements. Measures to detect have a preventative function, however, many detection efforts rely on catching an actor in the act or provide a safety net when an actor has attempted or made the decision to use a biological agent as a weapon on civil society. These efforts often refer to devices, sensors, disease monitoring, and public awareness. Mitigation refers to any measures used to lessen the impact of a deadly biological agent after they have been used.⁴² These measures range from medical countermeasures to public safety campaigns. Treating the incident has been the focus of many biodefense strategies. The research and development of bio-agents to create vaccinations or antivirals is an overarching objective in many of the strategies in biodefense policies. In the 2009 National Health Security Strategy, one strategic objective calls for an “effective countermeasure enterprise,” referring to a large stockpile of antivirals, drugs, and vaccines, in addition to conducting extensive research to develop such medical countermeasures (MCM).⁴³ However, it is important to understand the definitional nuances between biosecurity and biodefense. Biosecurity as defined by the White House’s Office of Science and Technology Policy as, “the protection, control of, and accountability for high-consequence biological agents and

⁴¹ Ibid. 1, p.199

⁴² Gregory Koblenz, the Deputy Director of the Biodefense Graduate Program at George Mason University and author of *Living Weapons: Biological Warfare and International Security*

⁴³ 2009 National Health Security Strategy

toxins, and critical relevant biological materials and information within laboratories to prevent unauthorized possession, loss, theft, misuse, diversion, or intentional release.”⁴⁴

In various studies of biodefense and biosecurity these terms have been used interchangeably to the detriment of clarity. In an effort to provide a clear analysis on the effectiveness of biodefense strategies, this analysis will focus on biodefense as a broad defensive strategy to counter the intentional use of biological weapons. However, biosecurity will be mentioned when explaining various domestic policies in implementing a biodefense strategy, particularly in safeguarding against and responding to both naturally occurring and engineered biological threats stemming from accidents.

In order to examine how these methods are factored into biodefense strategy and how this relationship influences security, this study will use and elaborate on Koblenz’s categories of biodefense strategies namely medical countermeasures, surveillance, and physical protection.⁴⁵ Since any strategy to prevent or stop the creation, use, and impact of a biological weapon are technically medical countermeasures, this paper will categorize them as research and development. However, one of the major critiques of biodefense strategies is that there are no concrete strategies for implementing and defining biodefense measures.⁴⁶ Therefore, the measures that Koblenz lays out provide the best foundation and most comprehensive framework for assessing biodefense strategy.

To begin, this study will focus on biodefense in its varying degrees of defensive effectiveness based on the biodefense methods previously mentioned, prevent, detect, mitigate and treat. Even though all biodefense strategies consist of these methods some

⁴⁴ White House’s Office of Science and Technology Policy

⁴⁵ Koblenz (2009, 28)

⁴⁶ Guillemin 2011, 256

employ other methods more than others, assuming that prevention is the most effective defensive method for protecting the public. The study will begin with examining states' monitoring and detection systems, specifically, workforce training, bio-surveillance databases used to identify dangerous bio-agents, and research facilities oversight; Followed by physical protection strategies, from public infrastructure and private investments to basic emergency equipment distribution. Lastly, it will look at research and development. Research and development strategies are generally medical and scientific in nature and consist of developing vaccines and antibiotics in the form of medical countermeasures (MCM) that will serve as cures or preventative safeguards against weaponized bio-agents. However, this section will also address the dual-use dilemma of bioresearch and the Biological Weapons Convention's verification and compliance challenges due to the dual-use designation of many programs. All three of these strategies create a comprehensive breakdown of the larger biodefense strategy. Whether a balanced collection of all three factors or an aggressive, dominate approach with one, it is the aim of this paper to examine the effectiveness of these strategies within the broader biodefense strategy in keeping the public safe from intentional biological weapons use.

Ultimately, these categories will provide a methodological framework for discussing bioweapons security implications in an age of robust biodefense programs. Expressed representationally if bD =biodefense, mC = medical countermeasures, m = monitoring, p =physical protections, and nS =national security then $bD(mC+m+p)=nS$. Given this equation, an increase in mC , m , and p will increase bD contributing also to an increase in nS ; or an expansion of defense strategies will increase biodefense and

therefore increase outcomes in national security. Note that this equation is symbolic and does not have the quantitative backing to measure the exact outcome of security based on these variables and it is a representational expression of a hypothesis. Drawing on the basic inference of this equation, I will examine the biodefense policies during the 2001 Anthrax Letters attack as a way to show the effectiveness of each category on national security.

Case Study

Amerithrax: The 2001 Anthrax Letters

The 2001 Anthrax Letters case study will not focus on the legal story and investigation, rather it focus more on the biodefense program and many of the systemic problems stemming from biodefense programs and the insecurity they posed during this time. The analysis of the 2001 Anthrax Letters is organized by first focusing on the previously formulated equation $bD(mC,m,p)=nS$ and expanding on the biodefense strategies employed by the United States. First, it will look at research and development strategies during pre-911. Second, it will examine the monitoring and detection factors employed during that time at facilities handling dangerous bio-agents. Additionally, it will discuss surveillance systems in labs, on scientists handling deadly pathogens and the pathogens themselves. Third, it will look at the physical protection measures in place to handle the victims and the public facilities, specifically, the process that officials took to clean and process congressional offices, postal offices, hospitals, and victims' homes.

At the time of the attacks, U.S. officials did not know if the attacks had been an act of terror promoted by a non-state actor or a rogue state. This question alone gave the intelligence community their starting point; find out where the weapons grade anthrax

came from. Initial analysis supported the claim that the anthrax used was too sophisticated to be from a basement effort with a basic understanding of biology, therefore they believed that it was from a state program. After six years of investigation the analysis verified that the anthrax originated from Ames strain of *Bacillus anthracis* that later revealed RMR-1029 found at USAMRIID was the source for the weapons grade anthrax in the 2001 letters. This led to two American scientists as suspects for propagating homegrown bioterror.⁴⁷

Leading up to October 2001 there were three known sites that produced anthrax and worked with dry spores: Battelle, Dugway, and DRES, and their associate labs and subcontractors. Battelle is known to have routinely used dry spores for experiments on aerosol capabilities in biodefense research. Dugway is known to have produced anthrax in a powder form a few years before 2001. They also produced the anthrax found in flask RMR-1029 at the U.S. Army's Medical Research Institute of Infectious Diseases (USAMRIID), the flask that is suspected to have supplied the anthrax letters. Battelle and Dugway work together in several locations and have shared materials, in addition to sharing materials with others, including RMR 1029 with "private" facilities for "legitimate purposes".⁴⁸

After the attack members of the U.S. Congress agreed that bioterrorism was a real threat and made civil biodefense a priority, emphasizing biomedical protection. In 2002 the budget for defense against bioterrorism increased to over \$3 billion dollars, which was just in the millions during the Clinton Administration. With fear driving the strategy behind the biodefense funding, large amounts were allocated to research on anthrax,

⁴⁷ FBI, 2010

⁴⁸ Hugh-Jones, et al. 2011

smallpox, plague and other pathogens. Additionally, high-containment laboratories were also built to protect the research on these various pathogens. The Strategic National Stockpile, a repository of antibiotics, vaccines, and critical medical equipment and supplies, which provided supplies after the anthrax letters attack also, received a significant increase in funding from \$81 million in 2001 to \$1.157 billion in 2002.⁴⁹

Laboratories with a biosafety level 4 (BSL-4), the highest level of safety tripled from 2001 to 2008. Now, 15 of these BSL-4 laboratories all around our country are responsible for conducting research on the most dangerous pathogens.

Research and Development

At least 22 victims contracted anthrax as a result of the mailings. Eleven individuals contracted inhalational anthrax by inhaling *Bacillus anthracis* spores and another 11 suffered anthrax by absorbing it through the skin. Five of the inhalational victims died from their infections: Robert Stevens, 63, photo editor, AMI, Boca Raton, Florida, died on October 5, 2001; Thomas L. Morris, Jr., 55, postal worker, Brentwood Post Office, Washington, D.C., died on October 21, 2001; Joseph P. Curseen, Jr., 47, postal worker, Brentwood Post Office, Washington, D.C., died on October 22, 2001; Kathy T. Nguyen, 61, hospital employee, New York City, died on October 31, 2001; and Otilie Lundgren, 94, Oxford, Connecticut, died on November 21, 2001. Another 31 people tested positive for exposure to anthrax spores. Ten thousand more people, deemed “at risk” from possible exposure and were treated with an antibiotic prophylaxis.⁵⁰

Without the research of anthrax and the development of a treatment many more people would have died and the impact would have been much more severe. However, many

⁴⁹ Guillemin 2011, 125

⁵⁰ FBI, 2010

contest that if the United States had not been stockpiling a dangerous pathogen like RMR-1029 then this event would not have taken place. The threat from the anthrax letters was not exclusively dependent on the availability of anthrax, but the concern is that biodefense makes us less secure by proliferating biological agents that could potentially serve as biological weapons.

The threat of biological weapons is not overstated or exaggerated and there is a need to think of ways to safely counter their impacts. Yet, with all the funding going to developing new ways to counter deadly pathogens people are still at risk. In September 2009, a scientist at the University of Chicago, researching a vaccine for the plague died after being accidentally infected with the disease. Accidents will happen and there are few biodefense strategies that can prevent human error from happening. This was the thinking behind a community in Kansas' fight against a BSL-4 lab that would be potentially researching highly contagious foot-and-mouth disease. The community is home to 10% of the United States' cattle industry and an outbreak would devastate the economy and cost billions in damages.

Monitoring and Detection

During the 2001 Anthrax Letters much of the delivery system for disseminating the pathogen was not a sophisticated aerosol device or a highly engineered warhead; rather it was an American postal worker unaware of the dangerous spore hidden in what appeared to be everyday first-class mail. The ease to which this attack impacted national security is still today an embarrassment. Yet, most of the funding for biodefense is still being allocated to research and development and not securing the facilities and monitoring the scientists involved in the work. For example, in 2008 the General

Accountability Office told Congress that, no particular federal agency could identify the exact number of BSL-3 Laboratories. In addition, in university labs as well as some private labs funded by government grants, scientists are not subject to security clearances or background checks. During the 2001 Anthrax Letters, one important detail remains; the number one suspect is the scientist that worked inside the lab.

Knowing this simple fact makes pumping money into more opportunities for developing deadly pathogens so a “mad scientist” can threaten national security seem like a bad policy. Instead we should be tightening our monitoring and detection systems and making improvements to physical infrastructure. The Department of Homeland Security turned to surveillance as its antidote to bioterrorism installing a BioWatch program that relies on air sensors to monitor 30 U.S. cities for deadly pathogens. During the 2001 Anthrax Letters, two of the people that died and hundreds that were treated came from the United States Postal Service (USPS). After the attacks USPS installed real-time Biohazard Detection Systems (BDS). This type of monitoring will save lives without creating more opportunity to put more at risk.

Collecting data and analyzing it to create models and forestall and foresee bioterrorism threats is an ideal use of the technological advances. Additionally, one of the primary defenses against bioterrorism is intelligence. President Obama, addressing the bioterrorism issue said, “enhanced intelligence to thwart bioterrorist incidents” was the best approach against an attack.⁵¹

⁵¹ Guillemain 2011, 260; Further President Obama stated, “And we are launching a new initiative that will give us the capacity to respond faster and more effectively to bioterrorism or an infectious disease—a plan that will counter threats at home and strengthen public health abroad.” Office of the Press Secretary, The White House, Remarks by the President in State of the Union Address, January 27, 2010. This new initiative focused heavily on intelligence sharing and gathering of bioterrorism. For example, *the National Counterterrorism Center established a working group on chemical, biological, radiological, nuclear*

Physical Protection

During the Clinton Administration key government buildings had been equipped with ventilation systems to protect against biological agents. Yet, the congressional offices targeted by the anthrax letters were not protected. Physical protections are a key strategy in biodefense, yet, very little has been done to promote retrofitting all government buildings and large private skyscrapers with HEPA filters and possible sensors. As mentioned before retrofitting buildings with HEPA filters would be low cost and would provide protection against a massive airborne attack on a skyscraper.

Billions have been spent in building high-containment laboratories, but in August 2005, Hurricane Katrina flooded a Galveston BSL-4 lab causing scientists to leave deadly microbes unsecure for days. Officials reassured residents that no harm was done, but this raises the issue supported in 2001 that public awareness and response to incidences are severely overlooked. The public will need to understand what to do during the time of a massive bioterror attack or a bio-agent leak from a BSL-4 laboratory. Similar to the any natural disaster response, the government should encourage a biological disaster kit that would include facemasks, filters, water and a public health action plan on what one should do; much like earthquake preparedness kits and first-aid kits.

Conclusion

In October of 2001, seven letters containing weapons grade anthrax was delivered to two Senate offices and five major news media outlets. These seven letters contaminated multiple facilities that cost the United States approximately \$6 billion in damages and five individuals their lives. The psychological impact of this attack still

guides policy and drives the justification for biodefense expansion. Security measures have been introduced and suggested far beyond the scope that this incident evolved. During fiscal year 2010 to 2011 the United States spent roughly \$879 billion on biodefense for the Department of Homeland Security and \$663 billion in the form of countermeasure research and development.⁵²

The previously stated question as to whether national biodefense strategies are effective in maintaining national security objectives to safeguard against biological attacks can be answered with the following conclusions. Biodefense research and development on medical countermeasures is a strategy that creates the greatest insecurity. The equation presented earlier in this paper suggested that an increase in any of the strategy measures contributed to an increase in biodefense and subsequently increased national security regardless of what that strategy measure was. This is flawed based on the observation that medical countermeasures proliferate dangerous pathogens at the risk of causing a pandemic or encouraging other states to counter others' medical countermeasures' research, which create secret biodefense programs that can't be monitored. From this case study we see that not all biodefense strategies are created equally and that it may be too simplistic to declare biodefense causes insecurity. We have seen how many factors make up biodefense and the various outcomes each has. Yet, there are particular strategies that multiply threats and others that are truly defensive in nature. The 2001 Anthrax Letters provide a great narrative for explaining this complex relationship for at least two reasons. One, the case is still inconclusive due to many of the reasons that make biological weapons very dangerous and two, the impact it had on national security spending in biodefense.

⁵² Franco, Sell, 2010

Through this analysis, it is conclusive that proliferating biological weapons for the sake of defensive strategies is not the path toward security. Governments should work together to bring biodefense programs out of obscurity and secrecy. The dual-use dilemma of biodefense is due to states dishonest practices and misrepresenting their intentions. Once we reveal the true nature of biodefense by actually engaging in measures that will defend, like retrofitting buildings with HEPA filters and sensors, increase intelligence collection and analysis, and invest in public preparedness and response, we will be better off.

The 2001 Anthrax Letters teaches us a lot about what went wrong in our security, but we are making the same mistakes and in some sense increasing the potential for a bigger problem. Plainly stated, we are less secure with the current biodefense strategy. Its effectiveness has not been proven and throughout this paper it has explained that the United States is promoting biodefense strategies that are creating insecurity and are not effective defensive strategies.

CHAPTER TWO

Bioterrorism: An Unhappy Union between Violent Non-State Actors and Biotechnology

Introduction

Biological agents as we know them today have been the source of much concern since civilization can record. Illnesses wiped out populations without any effort and forced humans to quickly adapt to their changing environment, whether by scientific breakthrough or quarantine. Yet, it was not until man learned how to use these illnesses as a tool that biological *weapons* were first invented.⁵³ We now live in a time where biological weapons are considered a ‘weapon of mass destruction’ (WMD).⁵⁴ Although, modern medicine has brought about the possibilities to mitigate the impact of a variety of biological agents, and modern-day society has not experienced the impact of a biological weapon with mass destructive possibilities, the WMD designation still holds up. The aim of this paper is not to question the designation, but to add specific analysis for explaining why biological weapons are or are not a threat.

The Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism of 2008 suggested, the next large terror attack on the United States would likely be carried out using a biological weapon and before 2013, if we did not take the appropriate steps to safeguard against bioterrorism.⁵⁵ 2013 has come and gone without a

⁵³ Koster, John. "Smallpox in the Blankets." *Wild West* 25, no. 2 (August 2012): 36. (accessed Feb. 4, 2013).

⁵⁴ Joint Publication 3–40, Combating Weapons of Mass Destruction (Washington, DC: JCS, June 10, 2009), iii–iv, mentions the adoption of a new definition; see also GL–6; available at www.dtic.mil/doctrine/new_pubs/jp3_40.pdf

⁵⁵ Graham, Bob, James M. Talent, and Graham T Allison. *World At Risk: The Report of the Commission On the Prevention of WMD Proliferation and Terrorism*. New York: Vintage Books, 2008. <http://www.absa.org/leg/WorldAtRisk.pdf> p. xv

major terrorist attack since 9/11 and especially not one involving biological weapons. Which leads to the question; have experts in the field of bioterrorism and biodefense convinced the public that the threats from biological weapons pose greater dangers to society than they actually do? Or did the commission's recommendations get implemented in time to prevent a large-scale biological weapons attack? Whatever the reason, this study seeks to understand the relationship between deadly biological agents and violent terrorist organizations and how this dangerous couple became one of the leading national security threats post-WWII. Yet, a more important question given this potential threat is; why the United States has not experienced a large scale, biological weapons attack by a non-state actor in the post WWII era?

In order to address why the United States has not experienced a large scale, biological weapons attack by a non-state actor in the post WWII era, this study will examine various themes on technological advancements in biotechnology and the methods of operation and organizational structure of terrorist groups. More specifically, it will apply; revolutionary versus evolutionary based narratives on the threats posed by biological agents; second, it uses this information to examine technology's influence on terrorist organizations' weapons choice; finally, the study will compare terrorist organization structure and terrorists' method of operation to create a concise profile of the most likely bioterrorist. By synthesizing this information, it will provide a concise model for explaining why non-state actors have not used biological weapons in a large-scale attack.

Literature Review

Gregory Koblentz, Deputy Director of the Biodefense Graduate Program at

George Mason University said it best, “biological weapons present a number of paradoxes and dilemmas. They are widely feared, yet rarely used.”⁵⁶ There are a lot of conflicting points concerning the difficulty to which biological agents can be acquired, the amount of damage biological weapons can do, and the appeal of biological weapons to meet terrorists’ objectives in future attacks. These points contribute to understanding if weaponized biological agents are a threat to global security and should be considered a weapon of mass destruction (WMD). The arguments within these conflicting points can be categorized into two camps; 1) biological weapons are a threat, 2) biological weapons are not a threat. However, there are those that make up a third camp that claim a certain set of criteria determines the threat biological weapons can pose, such as: bioagent used, amount, a group’s motivation, intention, etc. For example, Kortepeter and Parker, researchers at the U.S. Army Medical Research Institute of Infectious Diseases in Fort Detrick claim, that at the most dangerous end of the spectrum are large groups that are well funded and generally supported by a state.⁵⁷ These types of groups pose the greatest threat due to access, resources, and capabilities. However, historically, groups that have used biological agents as weapons have been smaller, non-state actors with specific targets and in some cases lone-wolf terrorists with no organizational affiliation.⁵⁸

Although, the third camp provides important analysis on the varying degrees of danger posed by biological weapons based on several conditions and factors, the other two camps provide the foundation for establishing the nature of the designation, *threat*.

⁵⁶ Koblentz, Gregory D., *Living Weapons: Biological Warfare and International Security*. Ithaca: Cornell University Press, 2009. p. 228

⁵⁷ Kortepeter, Mark G., and Gerald W. Parker. "Potential Biological Weapons Threats." *Emerging Infectious Diseases* 5, no. 4 (July 1999): 523-527. Academic Search Complete. p.525

⁵⁸ Rajneesh in Oregon and 2001 Anthrax letter attacks. Gerstein, Daniel M., *Bioterror In the 21st Century: Emerging Threats In a New Global Environment*. Annapolis, Md.: Naval Institute Press, 2009.

For example, nuclear weapons are a dangerous threat regardless of who processes them; however, the threat from a biological agent depends on the knowledge of its user and the virulence of the causal agent. Without proper knowledge of handling and weaponizing, the user runs the risk of self-infection and inoperability.

Biological Agents: A Threat

As part of the first camp that believes biological weapons are correctly designated a threat and a WMD, Gerald Epstein suggests that biological weapons will continue to become more of a threat due to the lack of preparedness in U.S. response systems and their inability to manage an epidemic caused by the use of biological agents. He highlights the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism's failed predictions on a major biological weapons attack, but cautions that the lack of an attack does not negate the actual threat of biological weapons by being unprepared and that the U.S. government needs to continue to be alert and ready for an epidemic caused by a dangerous biological weapon.⁵⁹ Jeanne Guillemin, a medical anthropologist and authority on biological weapons, echoes the warnings from others that biological weapons pose an asymmetrical threat to unprotected civilians and are a very real "weapon of mass destruction" based on the notion that like a nuclear weapon, biological weapons indiscriminately kill all beings.⁶⁰ Falkenrath, Newman and Thayer suggest biological weapons pose the greatest threat due to their suitability for covert attacks and ability to spread as a pandemic. Gerstein highlights the 21st century's development of globalization as biological weapon's threat multiplier due to the

⁵⁹ Epstein, Gerald L. "Biosecurity 2011: Not a year to change minds." *Bulletin Of The Atomic Scientists* 68, no. 1 (January 2012): 29-38. Academic Search Complete.

⁶⁰ Guillemin, Jeanne, *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism*. New York: Columbia University Press, 2005.

communicable properties of some biological agents.⁶¹ Furthermore, supporting Gerstein's claim, Zimmerman in *Killer Germs*, elaborates on the history and dangers that various germs, viruses and infectious diseases have had and continue to have on human populations as well as other species. Zimmerman conveys a serious problem with bioterrorism based on the premise that biological agents are deadly regardless of how they're introduction to a population.

Even though there are many scholars and experts that believe biological weapons are a threat irrespective of conditions, the argument against them still persists. As part of the second camp that doesn't believe biological weapons are a threat, Susan Wright expresses the notion that biological weapons have become an overblown, sensationalized and political issue.⁶² She references several failed attempts by non-state actors to use biological agents to harm civilian populations to illustrate the low impact of each attempt and the exaggerated response. Milton Leitenberg supports Wright's research and adds that the threat in biological weapons is from large, secretive, defensive programs that are run by states and that the focus on terrorist organizations seeking to use biological agents is misguided. He claims that terrorist groups, al-Qaeda included, do not have biological weapons capabilities or the capacity to genetically engineer their own agents.⁶³

Biotechnology and Terrorism

Kathleen Vogel, frames the threats from biological agents into greater context by dividing these two camps, not into believers and none believers, but into two

⁶¹ Gerstein, Daniel M. "BIOTERROR in the AGE of BIOTECHNOLOGY." JFQ: Joint Force Quarterly no. 57 (2010 2nd Quarter 2010): 78-85. Academic Search Complete. p.83

⁶² Wriqth, Susan. "TAKING BIODEFENSE TOO FAR." *Bulletin Of The Atomic Scientists* 60, no. 6 (November 2004): 58-66. Academic Search Complete.

⁶³ Leitenberg, Milton, James Leonard, and Richard Spertzel. "Biodefense crossing the line." *Politics And The Life Sciences* 22, no. 2 (September 2003): 2-3. *OmniFile Full Text Mega (H.W. Wilson)*.

technologically driven narratives, biotech revolution and biotech evolution. Vogel claims, a revolution-based approach is the current understanding of the intelligence community and policy makers.⁶⁴ She refers to four principles in Gerald Epstein's hypothesis on the revolution approach that biotechnology is growing in power, widely available, more familiar, and more decentralized.⁶⁵ These principles lead to overblown and frightening assumptions regarding the capabilities of terrorist organizations and the possibilities of high impact biological weapons. Conversely, the evolution-based approach considers complex social, economic, scientific and technical problems that shape and influence scientific developments. She relates commercial sector biotechnical advancement barriers to biological weapons development barriers and further suggests that assumptions or analyses that do not include evolution-based considerations are not reasonable. Vogel suggests the revolution narrative proponents view technology as the primary driver for increased bioterrorism and that terrorists will exploit modern biotech advancements, lowering the technical bar giving rise to greater vulnerabilities. However, she references historical record to show that terrorist organizations have not demonstrated their technical aptitude or desire for biological weapons.⁶⁶

Brian Jackson and David Frelinger explore technology's influence on terrorists' weapons choices and targets. At the crux of their argument, they suggest terrorists are not averse to using technology, but want the 'most bang for their buck.' Most serious terrorist organizations want the output and versatility in their weapons in order to meet or exceed the technological and resource investment it takes to acquire the weapon. In their

⁶⁴ Vogel, Kathleen M. "Intelligent assessment: Putting emerging biotechnology threats in context." *Bulletin Of The Atomic Scientists* 69, no. 1 (January 2013): 43. MasterFILE Premier.

⁶⁵ Ibid. 7, p.29

⁶⁶ Vogel, Kathleen M. "Intelligent assessment: Putting emerging biotechnology threats in context." *Bulletin Of The Atomic Scientists* 69, no. 1 (January 2013): 43-52. *Academic Search Complete*.

analysis they focus on terrorist organization structure, targets, intention and time as influencing factors on terrorist decisions on technology.⁶⁷

Echoing this claim made by Jackson and Frelinger, James Forest suggests, terrorists want a guaranteed level of operational success from weapons. He further explains that as weapons become more costly, complicated to acquire, transport, and operationalize, terrorist expect more for the hassle. Biological weapons in this context does not meet the 'probability of success' that terrorist expect for the technical complexity.⁶⁸

Organizational Structure and Methods of Operation

Gerstein succinctly categorizes terrorist organizations into three distinct groups; traditional, waning, and apocalyptic. He explains that traditional terrorists use violence to specifically pursue their political objectives and are responsive to the favor of their support base. Second, waning terrorist groups start out using violence to pursue political objectives, but slowly move away from violence and become more of a political entity. Finally, apocalyptic terrorist operate under a violent and mass casualty ideology with no regard for adversarial retribution or constituent support.⁶⁹

Gerstein claims that terrorist groups generally fit into the traditional or waning categories. The apocalyptic terrorists are a lot less frequent; yet, they are the most threatening of the three groups mainly because their actions are not influenced by the

⁶⁷ Jackson, Brian A., and David A. Frelinger. "Rifling Through the Terrorists' Arsenal: Exploring Groups' Weapon Choices and Technology Strategies." *Studies In Conflict And Terrorism* 31, no. 7 (July 2008): 583-604. *OmniFile Full Text Mega* (H.W. Wilson).

⁶⁸ Forest, James J. F. "Framework for Analyzing the Future Threat of WMD Terrorism." *Journal Of Strategic Security* 5, no. 4 (Winter2012 2012): 51-68. International Security & Counter Terrorism Reference Center, EBSCOhost (accessed May 5, 2013).

⁶⁹ Gerstein, Daniel M., *Bioterror In the 21st Century: Emerging Threats In a New Global Environment*. Annapolis, Md.: Naval Institute Press, 2009.

approval from their base and in many instances extreme uses of violence at the risk of their own lives are acceptable.⁷⁰ Although the research suggests these groups are most likely to use WMD because of their undiscerning ability to kill, Peter Phillips explains, the life-cycle of apocalyptic terror organizations are short-lived. He suggests that an organization's life span is linked to its grassroots support, the more support the longer a terrorist organization can be sustained. Phillips also claims that terror organizations compete with governments for grassroots support and this determines the intensity of violence.⁷¹

Gerstein's categories can be further distilled with Medina and Hepner's explanation of how terrorist groups organize. Like most organizations, terrorist organizations also operate under a structure. Medina and Hepner claim there are three general structures – hierarchical, decentralized, and leaderless resistance and multiple leaders models. They explain that leaderless resistance and many leaders models can be forms of advanced decentralization where individuals have no social connections to authoritative figures in the organization and are led by an idea, or a network in which the authoritative figures multiply to control specific regions where new hierarchies are created.⁷²

They also add that decentralized terrorist organizations can make for a more dangerous and efficient terrorist network structure. For example, branches, cells, and agents that don't communicate with network leadership can lose track of intended organizational goals. Their research highlights evidence that decentralized terrorist

⁷⁰ Ibid.

⁷¹ Phillips, Peter. "The Life Cycle of Terrorist Organizations." *International Advances In Economic Research* 17, no. 4 (November 2011): 369. p.374

⁷² Medina, Richard M., and George F. Hepner. "Advancing the Understanding of Sociospatial Dependencies in Terrorist Networks." *Transactions In GIS* 15, no. 5 (October 2011): 577-597. p. 579

networks may be led by less 'professional' terrorists, and while these terrorists are dangerous, the majority of them may not have the resources required to inflict major damages.⁷³

Lone-wolf terrorist can be classified as decentralized. Helfstein claims, lone wolf terrorists work within a pragmatic strategy based on resources, geography, targets, objective, and motives.⁷⁴ Ramon Spaaij, in his assessment of lone wolf terrorists, suggests that although lone wolf terrorists work and act alone they may sympathize and subscribe to a larger ideology where they derive support from others that also subscribe to a broader political or religious ideology.⁷⁵ According to Spaaij, the most common choice of weaponry for lone wolf terrorists is firearms, explosives, and armed hijackings. He suggests that this fact is indicative of their resources and acquisition.⁷⁶ Spaaij also highlights that lone wolf terrorists are not likely to use unconventional weapons, such as; nuclear, biological and chemical weapons. Yet, Walter Laqueur claims that lone wolf terrorists are most likely to use WMDs to advance their agenda because they have the least to lose.⁷⁷

Facts Tested by History

Furthermore, Falkenrath and Newman claim that non-state actors are not interested in using biological weapons for five reasons including: 1) mass casualties do not serve non-state actors objectives, 2) does not increase coercive power, 3) increased

⁷³ Ibid.

⁷⁴ Helfstein, Scott. "Governance of Terror: New Institutionalism and the Evolution of Terrorist Organizations." *Public Administration Review* (Washington, D.C.) 69, no. 4 (July 2009): 727-739. p. 735

⁷⁵ Spaaij, Ramon. "The Enigma of Lone Wolf Terrorism: An Assessment." *Studies In Conflict & Terrorism* 33, no. 9 (September 2010): 854-870. p.855

⁷⁶ Ibid. p. 856

⁷⁷ Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (Oxford: Oxford University Press, 1999), p. 269.

violence equates to a decrease support for the cause, 4) there are additional risks and challenges in acquiring deadly agents, 5) there is a risk in receiving stronger countermeasures and retaliation. They suggest that history supports their theory by pointing out that no non-state actor has successfully used a biological weapon.⁷⁸

Conclusions from the Literature

The research consulted has addressed key themes that will help address the broader question as to why the United States has not experienced a large-scale biological weapons attack during the past half century, post-WWII? Answering this question requires understanding the argument underlining whether or not biological weapons are in fact a threat worthy of being called a ‘weapon of mass destruction.’ These arguments can be neatly categorized into two narratives; revolutionary and evolutionary. These narratives help explain biotechnology as it relates to bioterrorism and the general perception experts and scholars have regarding its threat on society. The fusing of threat, technology and terrorism highlights the use and adaptation of technology by terrorists or terrorist organizations and how this influences their attacks. However, this requires an in-depth understanding of terrorist organization typology and further methods of operation.

Additionally, these themes allow for a general hypothesis leading to a preliminary answer of the previous question: why has the United States not experienced a large-scale biological weapons attack during the half century, post-WWII? Stated simply, bioagents are complex organisms that require advanced understanding of biotechnology and engineering to effectively weaponize them into a WMD and this understanding is

⁷⁸ Falkenrath, Robert A., Robert D. Newman, and Bradley A. Thayer. *America’s Achilles’ Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack*. (Cambridge, MA: MIT Press, 1999). p.37-58

currently beyond the advancements of modern biotechnology. Further, terrorists are conservative in their weapons choice and are in some cases sensitive to blowback, either from their support base or severe retaliation from their target. Therefore, our general assessment of bioweapons does not suit the terrorist or the terrorists' objective.

Methodology

World War II marked a significant shift in the way governments and the public viewed biological weapons (BW). Biological weapons programs discovered after the war in Japan, Germany and the Soviet Union provided the evidence necessary to persuade world leaders that biological agents could cause as much human loss and destruction as conventional weapons and should be categorized as weapons of mass destruction (WMD).⁷⁹ However, it was not until after the Cold War that states started to abandoned biological weapons programs and focused on defensive measures, such as, creating vaccines and anti-virals.⁸⁰

The common perception among leaders in regards to biological weapons was second-strike capabilities provided enough deterrence against biological weapon armed states. However, the more pressing concern regarding BW came from non-states actors or rebel fighters acquiring these capabilities and using them on the state itself.⁸¹ Moving states to take precautions to safeguard against terrorists, rebel opposition, and even other states trying to steal or learn more about biological weapons programs. These precautions where in the form of hiding and denying a program's existence, developing a robust defensive program to offset its offensive BW program, or abandoning the program

⁷⁹ Spiers, Edward M. "Chapter 2: Deterrence and Disarmament: Responses to Chemical and Biological Warfare, 1919-93." *In History of Chemical & Biological Weapons*, 47-68. n.p.: Reaktion Books Ltd., 2010. *Military & Government Collection*. p.50

⁸⁰ Ibid. 26, p.34

⁸¹ Ibid 26, p.49

altogether to support international efforts to promote non-proliferation of BW. These multilateral efforts to curb biological weapons development and use can be key indicators as to why we have not seen a large scale biological weapons attack since WWII. However, it does not account for states that did continue developing the capabilities and states that developed deadlier and more virulent agents under a “dual-use” designation. Additionally, it does not address the non-state actors’ role in using biological weapons in smaller scale attacks.

One could make the argument that historical non-proliferation efforts and international conventions to safeguard against biological weapons development are responsible for a low BW incidence rates post-WWII. Yet, this argument focuses on international, multilateral non-proliferation cooperation efforts and states’ capabilities; it does not explain why BWs are still considered a threat and a viable option for terrorist groups in the post-WWII era considering international safeguards. Further, it does not explain why small attacks using a BW have not had the effect that other WMD have had on society. For this reason, these efforts are not included in this analysis to explain the relationship between biological weapons and terrorism post-WWII.

Not all biological agents are equal.

Concerns about BW are rooted in historical events where human populations have been vulnerable or decimated by infectious diseases. Therefore, the fear comes from technological advancements to, intentionally or unintentionally create new viruses and bacteria or weaponize existing bioagents. However, this fear coupled with the fear of a surprise attack by a terrorist group illuminates our imaginations with endless possibilities

for mass chaos. Yet, in order to disaggregate the biological weapon threat from the terrorist threat, it is useful to briefly examine bioagents' designation.

Biological weapons use pathogenic organisms to inflict death or harm in humans, animals, and plants. Most biological agents used as a weapon are living organisms that can reproduce and multiply; this quality allows biological agents to have a large impact using little effort and a small number of organisms. Some biological agents used as a weapon can also spread from one organism to another, making the host organism a delivery instrument to propagate infection. Biological agents used in a military conflict or terrorist attack have the potential to create an epidemic, especially if local sanitation conditions are poor, public health infrastructure is weak, and there are large rural populations. In turn they can cause great impact to the entire population, potentially extending across borders.⁸²

Although the number of biological agents that could pose the greatest threat to public health is small, the biological agents included in that number, could potentially cause the largest threat to national security and public safety. Public health officials define threat by measuring the ability to limit the numbers of casualties and control the incident and prevalence of a disease.⁸³ Those agents that are difficult to control are considered more of a threat. Highly contagious diseases and airborne illnesses can have a larger impact than slower, curable bacteria.

W. Seth Carus' does a comprehensive analysis of traditional biological warfare, biocrimes, and bioterrorism and includes the bioagents used, acquired, attempted to acquire, involved in a threat of use, or expressed interest in using in his working paper,

⁸² Morales Pedraza, Jorge. "The Need to Establish the Organisation for the Prohibition of Biological Weapons: A Proposal for the Future." *Public Organization Review* 12, no. 1 (March 2012): 57-70. p.58

⁸³ *Ibid.* 5, p523

Bioterrorism and Biocrimes: The Illicit Use of Biological Agents in the 20th Century. In Figure 1, Carus categorizes the bioagents in two columns. For the purposes of this paper, I have distinguished between virus and bacteria because these have varying degrees of impact when disseminated. I also highlight the overlap in agents used in biowarfare and biocrimes and terrorism. The overlap in war and terrorism may indicate the most dangerous and most successful biological agent for causing death. For example, referring to salmonella, which is considered the least lethal agent, has not been used for biowarfare.⁸⁴

	Traditional biological warfare agents	Agents associated with biocrimes and bioterrorism
Bioagents	<i>Bacillus anthracis</i> (b anthrax)◇ <i>Brucella suis</i> ◇ <i>Coxiella burnetii</i> (Q fever)◇ <i>Francisella tularensis</i> (tularemia or rabbit fever)◇ <i>Smallpox</i> • <i>Viral encephalitis</i> • <i>Viral hemorrhagic fevers</i> • <i>Yersinia pestis</i> ◇	<i>Bacillus anthracis</i> *◇ <i>Coxiella burnetii</i> *◇ <i>HIV</i> • <i>Rickettsia prowazekii</i> (typhus)◇ <i>Salmonella Typhimurium</i> ◇ <i>Salmonella typhi</i> ◇ <i>Shigella species</i> ◇ <i>Vibrio cholerae</i> ◇ <i>Viral hemorrhagic fevers</i> (Ebola)*• <i>Yellow fever virus</i> • <i>Yersinia pestis</i> *◇

* Duplicates, ◇ Bacteria, • Virus

Figure 1

Source: Carus, 2001

According to the Biological and Toxin Weapons Convention (BTWC), biological agents are not only pathogens, but include biotoxins. The Centers for Disease Control

⁸⁴ I use 'lethal' in terms of the estimates reflected from a scenario when a 50-kg agent is released by aircraft along a 2-km line upwind of a population centre of 500,000. Salmonella was not included in this research. The research and table was conducted by Christopher, et al., JAMA 278; 1997: 412.

and Prevention define biotoxins as poisons that are derived or produced by plants, insects and animals. They are not living organisms that multiply and spread. However, many biotoxins are extremely deadly they are not often regarded as biological agents, but are often called biological weapons based on their biological origin.⁸⁵ Keeping in line with the BTWC, I will not exclude cases involving the use of biotoxins in terror attacks.

In order to answer the question as to why the United States has not experienced a large-scale biological weapons attack during the post-WWII era and to test the hypothesis that biological weapons do not suit the needs of terrorists, I will first merge terrorist groups' method of operation with their organizational structure to create a profile of the most likely group to use a biological weapon. Second, I will examine how technology factors into their weapons choices based on the previously established profile and the groups' past attacks.⁸⁶ Finally, I will examine biological weapons' capabilities with the groups' intent and motive.

Method of Operation

To the majority of people that have experienced or witnessed terrorism's violent means it is hard to imagine that there is a method of operation. These methods, as foreign or unconventional as they may seem, are intended and planned. Further, they have a rational purpose to the groups that conduct them; they are not random and are rarely without a larger purpose. This purpose depends widely on the group and their method of operation. This method may depend on size, origin, objective, etc. However, Gerstein

⁸⁵ Arnon SS, Schechter R, Inglesby TV, et al. Botulinum Toxin as a Biological Weapon: Medical and Public Health Management. JAMA. 2001;285(8):1059-1070.

⁸⁶ Jackson and Frelinger explore technology's influence on terrorists' weapons choices and targets. Jackson, Brian A., and David A. Frelinger. "Rifling Through the Terrorists' Arsenal: Exploring Groups' Weapon Choices and Technology Strategies." *Studies In Conflict And Terrorism* 31, no. 7 (July 2008): 583-604.

provides three concise methods of operation to work with such as, traditional, waning, or apocalyptic.⁸⁷

Traditional Method

The traditional method is one where the terrorist organization is politically influenced and uses tactics ranging from political activism to violent protest. Traditional methods of operation also suggests that support from the base is important and therefore, requires a longer life-cycle, which means they are also concerned about blowback or retaliation in response to violent campaigns.

A traditional method of operation is not likely to use a biological weapon based on the sensitivity to its base. The retaliation against the group will put supporters at risk shortening the organizations life-cycle. Additionally, the possibility of blowback and causing an epidemic among supporters can hurt the cause and weaken the political objective, countering any possible gains. Yet, biological weapons provide deniability and a possible way to evade any responsibility. Traditional methods can also violent, but are more strategic in their targeting in advancing their cause. Therefore, biological weapons could suit the needs of a traditional method of operation if it advances the cause in some way without the possible loss of support or extreme retaliation. A possible use could be smaller scale and more targeted, i.e. the 2001 anthrax letter attacks or more recently the 2013 ricin letters.

Waning Method

Waning terrorist operations start out as being mainly violent and eventually abandon violent means and focus on political gains. In similar fashion to the traditional method, they also seek the approval of their constituents and avoid high-profile, high-

⁸⁷ Ibid. 17, loc.602

violent methods. In this context biological weapons may lose their appeal because of human geography and the possibility of infecting themselves as well as their base.

The waning method of operation is probably the least likely to use biological weapons as a means to further its cause and meet its objective. Even in the earlier and more violent tactics, waning methods are more concerned with gaining favor and support. Due to biological weapons indiscriminate propagation, harming innocent women and children may not bode well with supporters. Additionally, waning methods are not solely concentrated on violent means to meet its objectives and groups tend to seek legitimate political means to support their cause. Also, the resources and expertise required to develop or acquire a biological weapon would be better used on more politically acceptable means on one side or cheaper conventional weapons on the other.

Apocalyptic Method

The apocalyptic method of operations is less interested or concerned with support from a base and is more violent, yielding more casualties as part of their goals or intentions. The term apocalyptic suggests that this method is not concerned with retaliation from the adversary, even with the possible destruction of their group and death of their supporters. However, groups acting under this method are dissuaded by the desire to maintain their cause and more motivated to use WMD to achieve its goal. Apocalyptic groups do not last long because they cannot survive without support or compete against government retaliation. They also have limited resources to carry out missions.

Therefore, apocalyptic methods of operation are the most likely to use biological weapons for two reasons; first, biological weapons can incite psychological fear in

society that last longer than any conventional explosion can, bring more notoriety and validity to their objective. Second, these methods do not consider constituents therefore, there is little thought given about whom it will effect or what supporters will disagree with the attack. Further, groups that utilize the apocalyptic method of operation might bypass the technological challenges of weaponizing a bioagent and use group members as hosts to spread a contagious disease, in an act of suicide, all for the cause. This type of tactic reduces the need for resources and is easily homegrown.

Organizational Structure

Organizational structure can influence the method of operation a group adopts, specifically based on its leadership. This influence will specifically inform the violence this group intends on pursuing and to what degree. There are three structures an organization can organize itself into; hierarchical, decentralized, leaderless resistance and multiple leaders model. Although, leaderless resistance and multiple leaders model are advanced forms of decentralized organization, I will still retain this as a separate category to include lone wolf and homegrown terrorist groups that have fewer members and are not formally tied to a larger group.⁸⁸

Hierarchical

The hierarchical organizational structure depends on a single leader with one or more subordinates handling various functions. Decisions are made at the top and orders trickle down to the bottom of the organization. This structure works well in a geographical area where it is easy to communicate with subordinates. Organizations that have utilized this structure have historically operated regionally. Hierarchical organizations are easier to retaliate against, since the leader is in a central or single

⁸⁸ Ibid. 20, p.579

location.

Decentralized

A decentralized organizational structure suggests that decisions on operations are not made at the apex of the leadership structure, always. Members in a decentralized organization plan and carry out operations guided by the larger organization objective. A decentralized organization does not rely on close geographical proximity to members in order to carry out objectives. However, communication between networks poses an issue for financial and technical supports. Decentralized organizations are less likely to invest time and resources in complex attacks requiring a lot of expertise.

Leaderless Resistance and Multiple Leaders

Leaderless resistance and multiple leaders models of organizational structure are similar to decentralized models, where members act autonomously, but are bound by an objective or ideology. This category accounts for lone-wolf actors. Groups that fit into this category do not have communications or support issues because they are in a lot of way autonomous from any larger organization.⁸⁹

In the following table (Figure 2) illustrating the likelihood and possible outcomes of various groups' ability to carry out a biological weapons attack and its possible outcome, I show that the most likely group to use a biological weapon are those with a; hierarchical organizational structure and apocalyptic method of operation; and a leaderless and multiple leaders organizational structure and apocalyptic method of operation. This table does not factor in technological barriers and is strictly based on the two variables.

⁸⁹ These overarching categories are based on the way most social networks organize outlined by Hepner and Medina (2011) from data collected by Hepner and Medina (2008).

Organizational Structure	Method of Operation			
		Traditional	Waning	Apocalyptic
	Hierarchical	Least likely to use a biological weapon with low impact	Would not use a biological weapon	Would use a biological weapon with high impact
	Decentralized	Could possibly use a biological weapon with significant impact	Could possibly use a biological weapon with significant impact	Would use a biological weapon with significant impact
	Leader Less/Multiple Leaders	Would not use a biological weapon	Would not use a biological weapon	Most likely to use a biological weapon with limited impact

Figure 2

Source: Author

Technology's Influence and Weapons Choice

In order to incorporate the technologies' impact on groups' decision to use biological weapons and to what degree, it is important to recognize that biological weapons can be highly sophisticated and deadly or unsophisticated with low impact, with varying degrees in between. To classify BW further, I consider low-tech BW, as using a bioagent to contaminate food, water, air with no complex mechanism to disseminate the agent. Conversely, a high-tech BW is using a highly virulent pathogen in a complex

delivery mechanism, much like aerosols.⁹⁰ I will also include James Forest's paradigm for explaining terrorists' weapons choice. Which suggests the more technologically complex a weapon is, the more a terrorist will expect from it, measured by probability of success; therefore, establishing a dependent correlation between weapon choice and impact.⁹¹ Terrorists' weapons choices are also based largely on targets and generally assess the best weapon to achieve maximum impact. In order to isolate cases where a weapon was chosen based on a target, I will use Jackson and Frelinger's typology of terrorist incidences by classes of operation; 1) attack on a specific individual; 2) attack on individuals in general; 3) attack on vehicles; 4) attack on a structure; 5) attack on an area.⁹² Since there are very few cases that involve biological weapons, I focus on answering the question as to why that is the case?

Case Studies

Biological weapons are considered a weapon of mass destruction and one of the biggest transnational threats in our day. Yet, very few terrorism cases point to the validity of this argument. In order to understand this contradiction of reality, I seek to examine random cases of domestic terrorism by non-state actors and use the previously outlined methodology to test my hypothesis stating, bioagents are complex organisms that require advanced understanding of biotechnology and engineering to effectively weaponize them into a WMD and this understanding is currently beyond the advancements of terrorist groups. Further, terrorists are conservative in their weapons

⁹⁰ Repez, Filofteia. "BIOTERRORISM -- PRESENT THREAT FOR SECURITY." *Bulletin Of The 'Carol I' National Defence University / Buletinul Universitatii Nationale De Aparare 'Carol I'* no. 1 (January 2012): 13-20. *International Security & Counter Terrorism Reference Center*.

⁹¹ Forest, James J. F. "Framework for Analyzing the Future Threat of WMD Terrorism." *Journal Of Strategic Security* 5, no. 4 (Winter2012 2012): 51-68. *International Security & Counter Terrorism Reference Center*, p.55

⁹² Ibid. 26, p.587

choice and are in some cases sensitive to blowback, either from their support base or government retaliation. Therefore, our general security estimate of bioterrorism does not suit the weapon or the terrorist.

Consider the four domestic cases of terrorism by non-state actors; the most recent, Boston Marathon Bombings; the Christmas Day Underwear Bomber; the 9/11 Attacks; and the Rajneeshee Cult in Oregon. These four cases provide a wide range of information to examine and test against my hypothesis.

Boston Marathon

On April 15, 2013, two men planted homemade explosive devises in a crowd gathered to watch the Boston Marathon. The explosive devises consisted of pressure cookers; an explosive powder that is usually fairly easy to make or acquire; shrapnel in the form of nails, bee bees and glass; and an igniter, which is still unknown.⁹³ This method of attack, a public explosion with a homemade devise from materials easily attainable from the Internet or local hardware stores is low cost, low tech and has been proven to have high impact.

The men involved were two, young Muslim-Chechen immigrants acting on their own accord, but inspired by radical Islamic lectures on the Internet by Anwar al-Awlaki, a radical Islamic Jihadist working with al-Qaeda's network in Yemen. The younger of the two men, Dzhokhar Tsarnaev told FBI interrogators that the attacks were in protest of the U.S. violence against Muslims in Iraq and Afghanistan.⁹⁴

⁹³ McDonald, Brent. "Bomb Details Emerge in Boston Case - NYTimes.com." The New York Times - Breaking News, World News & Multimedia. <http://www.nytimes.com/2013/04/17/us/officials-investigate-boston-explosions.html?pagewanted=all> (accessed May 1, 2013).

⁹⁴ Schmitt, Eric, Mark Mazzetti, Michael Schmidt, and Scott Shane. "Boston Plotters Said to Initially Target July 4 for Attack." New York Times. N.p., 2 May 2013. Web. 2 May 2013.

The two men worked together under a leaderless organizational structure and apocalyptic method of operation. Their methods were apocalyptic because they were using high-impact violence to fulfill their cause without consideration for support from a base or retaliation from the government. Additionally, they did not have a sustainable plan supporting their attack. In other words, detonating a device in a crowd of civilians and killing three individuals indiscriminately will not change their perceived relationship between the U.S. and Muslims.

According to my methodology, the actors in this case are most likely to use biological weapons with low impact, based on organizational structure and method of operation. Yet, they did not. For one, these men did not have the expertise or resources to cultivate or buy bioagents. Second, they used a method that would yield a large impact with the limited resources they had. Third, the men planned their attack based on the opportunity to kill a large amount of people outside, meaning they also chose their weapon based on ‘an attack on an area’ and this is an objective biological weapons cannot meet on the low-tech end.⁹⁵ My methodology suggests that they would only achieve limited impact if they were to use a biological agent because of the lack of resources and expertise leaderless/apocalyptic groups have. As Forest expressed, there is a dependent correlation between impact success and technical complexity. These technological restraints and desire informed how these men would carryout their attack.⁹⁶ Assuming these men did acquire a bioagent to use as a weapon, it is unlikely that they

www.nytimes.com/2013/05/03/us/Boston-bombing-suspects-planned-july-fourth-attack.html?pagewanted=all .

⁹⁵ Ibid.

⁹⁶ Ibid. 39

would have wanted to invest the time and resources to achieve its maximum lethal impact.

The Christmas Day Underwear Bomber

On Christmas Day of 2008, 23 year-old Nigerian, Umar Farouk Abdulmutallab attempted to blow up a commercial airliner by detonating explosives in his pants. The explosive Abdulmutallab attempted to use was made up of PETN and TATP, highly explosive materials, along with other materials. Abdulmutallab used a three-ounce full syringe with an unidentified substance to inject into his pants in order to create a chemical chain reaction that would ignite the PETN and TATP.⁹⁷ Had this explosion been successful it would have blown a hole in the airplane, probably causing it to crash.

Abdulmutallab was in communication with Anwar al-Alwaki in Yemen and supported by al-Qaeda in the Arabian Peninsula (AQAP). He purchased a \$2,800 plane ticket with cash and was flying with the bomb from Nigeria via Amsterdam to Chicago, where he had planned to detonate the explosive. After his failed attempt, AQAP praised Abdulmutallab as a hero and claimed the mujahedeen overcame many technical barriers to create the bomb and they were happy it made it past security.⁹⁸

This case is similar to Boston, where the method of operation is apocalyptic because of the suicide element to the attack. However, the organizational structure would be considered, decentralized. AQAP is part of the larger al-Qaeda network and

⁹⁷ CHANG, KENNETH. "PETN, Explosive Found on Flight 253, Is Among Most Powerful - NYTimes.com." The New York Times - Breaking News, World News & Multimedia.
http://www.nytimes.com/2009/12/28/us/28explosives.html?_r=0 (accessed April 5, 2013).

⁹⁸ Hosenball, Mark, Michael Isikoff, and Evan Thomas. "The Radicalization of Umar Farouk Abdulmutallab." Newsweek 155, no. 2 (January 11, 2010): 37-41. OmniFile Full Text Mega (H.W. Wilson), EBSCOhost (accessed March 6, 2013).

Abdulmutallab was acting under their direction, with their weapon.⁹⁹ According to my methodology outlined in *figure 2*, they would be likely to use a BW with significant impact. They would be ‘likely’ to use because they can share resources among various groups in the network and they can support with technical expertise and money. This event also shows that they are willing to develop alternative ways to inflict violence on society. However, their investment for new technology is now a waste once the intelligence community learns their method and counters it by introducing new scanners at airports and regulating liquids on planes.

The technological complexity deterrent does not suit this case because the use of chemical explosives is technologically complex. However, one explanation for not using biological weapons in this case is explained by, an attack on a vehicle, the previously mentioned classification of operation by Jackson and Frelinger’s.¹⁰⁰ Here the primary target was not the people it was the aircraft. Even a high-impact bioweapon would not make the statement that an exploding plane would. Therefore, Forest’s correlation may still apply here, where AQAP wanted a high-impact success for the resources they invested. In addition, it tested the technology and proved it could make it past security. This could contribute to the payoff for innovation.

9/11 World Trade Center Attack

On September 11, 2001, 19 members of al-Qaeda under the direction of Osama bin Laden hijacked four commercial airline jets. Two jets inevitably crashed into the two World Trade Center Towers, one into the Pentagon and another, meant for the White House, ended up crashing in rural Pennsylvania. The 19 men used knives, box cutters

⁹⁹ Ibid.

¹⁰⁰ Ibid. 35

and mace to overtake the crew and passengers on board.¹⁰¹ This attack was low-tech and high impact. It took less than two years and cost al-Qaeda roughly half a million dollars to implement.¹⁰²

In this case al-Qaeda was acting under a hierarchical structure and with traditional/apocalyptic methods. Their motivations were more in line with traditional methods as it pertained to their supporter base and how this attack would rally their base and show their validity. Yet, it was apocalyptic in its execution and outcome. Retaliation by their adversaries has severely crippled their reputation as well as killed many leaders, as well as Osama bin-Laden. In my methodology, I categorize al-Qaeda as hierarchical and apocalyptic. Therefore, they would use a biological weapon with high impact. Granted this is based on al-Qaeda's capabilities during 2000. At that time al-Qaeda had money and could have acquired a biological weapon from a stockpile in Iran, Iraq or Syria that could have inflicted illness on all of New York causing an immediate pandemic. However, there are no guarantees with biological weapons and at the price al-Qaeda invested in 9/11 they wanted a guaranteed impact and success.¹⁰³ Additionally, biological weapons would not have worked based on al-Qaeda's targets, structures. Once again, biological weapons are too technically complex to sufficiently deliver the desired impact of the group regardless of method of operation and organization structure.

¹⁰¹ 9/11 Commission Report. <http://www.9-11commission.gov/report/911Report.pdf>

¹⁰² Carter, S & Cox, A. 9/11: The Reckoning, One 9/11 Tally: \$3.3 Trillion. The New York Times, Sept. 8, 2012. http://www.nytimes.com/interactive/2011/09/08/us/sept-11-reckoning/cost-graphic.html?_r=0 (accessed April 12, 2013).

¹⁰³ Ouaghrham-Gormley, Sonia Ben. "Barriers to Bioweapons." International Security 36, no. 4 (Spring 2012): 80-114. Academic Search Complete, EBSCOhost (accessed February 17, 2013). p.89

The Rajneeshee

In 1984, an Indian based cult out of Oregon contaminated local restaurants salad bar with salmonella typhimurium purchased from a medical supply company.¹⁰⁴ The motive for this act was to influence local elections in favor of the Rajneeshee, who wanted to expand their compound. Their goal was to make people sick so they could not vote in the following day's election. Nearly 750 local citizens became ill due to the contaminated salad bar, fortunately the Rajneeshee still did not have the number they needed to win the election.

The Rajneeshee are not considered a terrorist organization, they are more a religious cult. Therefore, applying a method of operation is difficult because they did not operate under violent means, but if to isolate this one incident, they would be categorized as a hierarchical/traditional group. They fall under hierarchical because they follow their leader, Bhagwan Shree Rajneesh and traditional because they care about alienating their supporters. In my methodology, their category would be the least likely to use a BW with low impact. This is accurate given the situation of the Rajneeshee, they used a biological agent as a weapon with low impact. They could have used a stronger more viral agent to make the town sick, but that would not serve their purpose and it would also create blowback from supporters and the local government. The biological weapon provided cover and deniability. In addition, it was acceptable for their target as an attack on individuals and provided enough impact for the technical complexity they were willing to put forth.

¹⁰⁴ Guillemin, Jeanne, *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism*. New York: Columbia University Press, 2005. p.158

Conclusions from the Case Studies

Falkenrath and Newman set out five reasons why non-state actors are not interested in using biological weapons: 1) mass casualties do not serve non-state actors objectives; 2) does not increase coercive power; 3) increased violence and decreases support for cause; 4) additional risks and challenges in acquiring deadly agents; 5) risk receiving stronger countermeasures. In each case these factors played a role in weapons choice. The examined groups or individuals do not view casualties as an end, rather means to achieve their ends, which is usually furthering their cause. Coercive power requires display that gets a lot of attention and has an immediate impact, biological weapons can't provide. With al-Qaeda, increased violence may have the opposite effect that Newman and Falkenrath claim it will. However, the Rajneeshee Cult lost members and sympathizers when the public found out what their leaders did. Risks and challenges are key in biological weapons use. For one reason or another, biological weapons are hard to acquire and modify. Stronger countermeasures are difficult to quantify or qualify in these cases and in many ways the only strategic reason to use a biological weapon is the deniability of using it and avoid direct countermeasures. The Rajneeshee cult was able to evade any responsibility for their attack until a former member told authorities what had happened.

In the previously examined cases organizational structure, method of operation, target, resources and desired impact all contribute to the weapons decision. In the Boston Marathon Attack, the men were lone-wolf actors with limited resources and no long-term objective. Biological weapons would not work for the attackers because biological weapons are technically complex, and would not solicit the impact they desired. Similar

reasoning works for 9/11 and the Underwear Bomber, biological weapons could not blow up a plane or destroy a structure. In these cases the visual impact or cause mattered more than inflicting mass casualty, death was a byproduct and not a goal. Both cases, displayed a level of technical complexity and this requires an expectation for guaranteed impact and success, a guarantee that biological weapons cannot provide. In the one case where a biological agent was used as a weapon, the Rajneeshee cult provides a clear case for many contradictions in the literature concerning biological weapons. For example, their biological weapons use was controlled and strategically targeted, without mass casualty, and provided deniability to evade blowback.

	Method of Operation			
		Traditional	Waning	Apocalyptic
	Hierarchical	Least likely to use a biological weapon with low impact RASHNEESHEE	Would not use a biological weapon	Would use a biological weapon with high impact Al-Qaeda 9/11 ATTACK
	Decentralized	Could possibly use a biological weapon with significant impact	Could possibly use a biological weapon with significant impact	Would use a biological weapon with significant impact UNDERWARE BOMBER
	Leader Less/Multiple Leaders	Would not use a biological weapon	Would not use a biological weapon	Most likely to use a biological weapon with limited impact BOSTON MARATHON

Figure 3.
Source: Author

Plugging these actors into the previous table it is apparent there are many factors involved in a violent non-state actors' (VNSA) weapon choice and that organizational structure and method of operation tell us little about whether or not a group will and can pursue a biological weapons. The VNSA that did use a biological weapon is, according to the table the least likely to use a biological weapon. Unfortunately, there are not many cases of biological weapons use by a VNSA to plug into the table, further analysis on who will use a biological weapon is necessary. However, the table does provide a structure for the possible use of biological weapons by various VNSAs.

Conclusion

The concluding factors as to why the United States has not experienced a large scale, biological weapons attack by a non-state actor in the post WWII era are simply; biological agents are complex organisms that require advanced understanding of biotechnology and engineering to effectively weaponize them into a weapon of mass destruction and this understanding is currently beyond the advancements of modern biotechnology and modern terrorist groups and VNSA. Terrorists are technologically challenged and weigh weapons complexity against impact, expecting guaranteed high impact results for increasingly technical complex weapons. Furthermore, terrorist organizational structure and methods of operation determine the capability and motives for investing time and resources into technologically complex weapons and very few groups that have the capabilities and resources are not motivated enough to use biological weapons. Conversely, those groups that have the motivation to use biological weapons do not have the means. Therefore, the union between terrorism and biological weapons is an unhappy and dysfunctional relationship. The current assumptions on bioterrorism as

we understand it does not suit the group or the weapon and this is the main reason why the United States has not experienced a large scale, biological weapons attack by a violent non-state actor in the post WWII era.

There are many variables that could be included in this study to answer this question, and the study of this topic could be more comprehensive in referencing various efforts to mitigate the possibilities of violent non-states actors' abilities to acquire or use biological weapons. Additionally, an analysis on quantitative data comparing costs and impacts of conventional weapons to biological weapons would enrich the claims in this study. Yet, as this study adequately shows, the United States is safe from a large-scale bioterrorism attack until highly motivated, organized terrorists expect less impact for their effort, which given the previous data could be awhile.

CHAPTER THREE

Immunity: The Real Bioweapon

Introduction

In 2005, the National Security Council introduced the National Strategy for Pandemic Influenza; it noted that nearly 36,000 deaths and over 200,000 hospitalizations occur every year in the United States due to seasonal flu.¹⁰⁵ Given the impacts of the seasonal flu on the United States' already adequate health system, one can only image the devastating effect a highly virulent infectious disease would have on a densely populated city in the U.S. or one of these seasonal flu viruses on a less adequate health system in a developing country. Reportedly, the last three pandemics in, 1918, 1957 and 1968 caused approximately 100 million deaths, more deaths than World War I and World War II combined.¹⁰⁶ Based on these figures a pandemic with the deadly magnitude of the past would have disastrous impacts on the global economy, military readiness, civilian workforce, and stress the medical response and health systems.

Throughout history the introduction of disease and lack of immunity has shaped the geopolitical world and determined the strength of nations. Immunity has changed societies and sometimes provided unintentional strategic positioning. For many societies building immunity and fighting infectious diseases were as valuable as gaining territory or advancing technologically in defense and weaponry. For example, the Spanish's successful conquest over the Aztecs and Incas can be attributed to the Spanish

¹⁰⁵ Humphries, Mark Osborne. "Paths of Infection: The First World War and the Origins of the 1918 Influenza Pandemic." *War In History* 21, no. 1 (January 2014): 55-81.

¹⁰⁶ Kim, Joseph. "Are We Prepared For The Next Pandemic Flu Virus?." *Vital Speeches Of The Day* 79, no. 12 (December 2013): 407

conquistadors' immunity to smallpox and measles. These illnesses had a major physical and psychological effect on the indigenous populations in the Americas, as they watched their people suffer and die while the Spanish remained unharmed. This led to eventual Spanish dominance on the continent.¹⁰⁷ The unintentional consequence of the Spanish conquistadors' immunity led to the subjugation and downfall of the ancient Inca and Aztec civilizations in less than three years.¹⁰⁸ However, had the Spanish not dealt with these diseases previously in Spain then history would have told a different story. Therefore, can immunity to virulent, communicable diseases be used as a weapon of mass casualty and disruption?

Drawing on the experiences of historical pandemics and colonial epidemics and noting the role disease and immunity has played in the intentional or unintentional strategic advantage of one society over another, the proceeding study will examine how efforts to develop immunity to diseases advances national or international security or insecurity and to what degree, if any. It will answer whether or not immunity to virulent, communicable diseases can be used as a weapon of mass casualty and disruption? However, before examining disease and immunity on past and present society and their potential ability to cause mass casualty, it is important to point out that there are known bioagents assumed to be “critical agents”¹⁰⁹ in bioterrorism and biowarfare that do have

¹⁰⁷ Oldstone, Michael B. A. *Viruses, Plagues, and History*. New York: Oxford University Press, 1998. p30

¹⁰⁸ Ibid. p34

¹⁰⁹ “Critical agents” are defined by the Centers for Disease Control and Prevention in three categories A,B and C. Category A agent are classified as posing the highest risk to national security and can be easily disseminated or transmitted, result in high mortality rates, cause mass disruption, require special preparedness actions and precautions. Category B agents are those that have second highest priority and are moderately easy to disseminate, moderate mortality rates, require enhanced disease surveillance. Category C agents are emerging pathogens that can be engineered for mass production and dissemination due to availability and have the potential to create a public health impact. “Emergency Preparedness and Response: Bioterrorism Agents/Diseases” Centers for Disease Control and Prevention. <http://www.bt.cdc.gov/agent/agentlist-category.asp> (Date accessed: January 2013).

the aforementioned impact on society. Yet, less is assumed of non-critical agents such as, HIV/AIDS, methicillin-resistant *Staphylococcus aureus* (MRSA), influenza viruses, synthetic biology, and severe acute respiratory syndrome (SARS). Therefore, in this examination the conventional bioweapon “critical agents” will not be included. However, an examination of immunity to some of these other critical agents will be.

Literature Review

In order to properly examine the question as to whether or not efforts to develop immunity to diseases advances national or international security and to what degree can immunity become a weapon of mass casualty and destruction? The public implications of a healthy population have to be linked to the security of a nation. Additionally, health needs to be recognized as an implicit component of a national security or otherwise there is no reason to discuss public safety, disease surveillance, and any national system geared toward contributing to the well-being of the populace. It is not an oversight that States that contribute to economic development in developing countries rely heavily on providing assistance for health infrastructure, HIV/AIDS education and prevention, and sanitation related projects.¹¹⁰ As Dr. Harley Feldbaum suggests health assistance is an important “soft power” tool in foreign policy and has a direct link to protecting national security interests. He highlights that international influenza surveillance was non-existent leading up to 2003 when H5N1, avian flu presented itself as a potential threat to national security as a pandemic and then between 2004-2008, \$2 billion was allocated to combat the disease.¹¹¹ Considering health as a ‘soft power’ creates confusion around the notion or concept of ‘health security’ and for the purposes of this examination, ‘health

¹¹⁰ Feldbaum, H., Lee, K., Michaud, J. “Global Health and Foreign Policy.” (2010) *Epidemiologic Reviews*, 32 (1), pp. 83

¹¹¹ *Ibid.* pp. 85

security' is concerned with the protection of populations from public health threats and how these threats influence foreign policy or state insecurity.¹¹² Similarly, many developing nations have speculated that 'health security' is code for securing the west and those efforts to survey disease have drastically decreased efforts to provide preventative and primary care in developing countries.¹¹³ However, Feldbaum and Lee identify three key themes in health security relevant to national security concerns: First, infectious disease poses a great threat to individuals, populations or states in a highly interconnected world; Second, pathogens may be used by terrorists or weaponized by state-sponsored defensive biological programs; Third, a severe disease burden can impact and threaten the stability of states and regions socially, politically, economically and militarily. HIV/AIDS is often an example of the impact of a disease burden in poorer developing countries.¹¹⁴

Lee Jong-wook, former Director-General of the World Health Organization claimed pandemics do not know international borders.¹¹⁵ After the emerging H1N1 epidemic in 2005, influenza started to get more international attention with the World Health Assembly (WHA) revising and adopting a new WHA Resolution 58.3.¹¹⁶ The revised Second Article of the International Health Regulations state that the scope and purpose of the regulations are "to prevent, protect against, control and provide a public

¹¹² In his analysis of health security Aldis deconstructs the confusion around health security and provides clear and distinct categories where 'health security' is shared between varying interests. Aldis, William. "Health security as a public health concept: a critical analysis." *Revista Gerencia Y Políticas De Salud* 8, no. 17 (December 2009): 12-27. p.5

¹¹³ Rushton, Simon. "Global Health Security: Security for Whom? Security from What?" *Political Studies* 59, no. 4 (December 2011): 781.

¹¹⁴ Ibid, p.783

¹¹⁵ World Health Organization, "World Health Assembly adopts new International Health Regulations: New rules govern national and international response to disease outbreaks" (2005).

¹¹⁶ World Health Organization, Revision of the International Health Regulations, WHA58.3, Fifty-eighth World Health Assembly (2005).

health response to the international spread of disease in ways that are commensurate with and restricted to public health risks." This concept of security through public health was further emphasized in 2006 as the United States Congress passed the Pandemic and All-Hazards Preparedness Act (PAHPA) which created the Office of the Assistant Secretary for Preparedness and Response (ASPR) within the Department of Health and Human Services. The ASPR is responsible for developing the National Health Security Strategy (NHSS) for the United States, which outlines the nation's response to large, potentially harmful public health incidents, including incidents caused by bioterror and natural disasters.¹¹⁷ Yet, one of the largest programs managed by the ASPR is the BioShield Project, an act passed by congress calling for the development and purchase of medical countermeasures in the event of a bioterrorist attack. The project expanded the stockpile of the smallpox vaccine to cover vaccinations for every person in the U.S., including half a million soldiers.¹¹⁸

In addition to providing funding to develop medical countermeasures (MCM), the United States Department of Health and Human Services also developed a strategy to enhance innovation, science and capacity, in addition to continuing to counter identified threats with the Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) strategy.¹¹⁹ A former U.S. Secretary of Health and Human Services, Kathleen Sebelius speaking on why she wanted a review of the MCM enterprise in the U.S. said, "the ultimate goal of this review is a modernized countermeasure production process where we have more promising discoveries, more advanced development, more

¹¹⁷ HHS ASPR. 2009. National Health Security Strategy

¹¹⁸ Project BioShield Annual Report to Congress

https://www.medicalcountermeasures.gov/media/33065/pbs_report_2012_hires_final2_508.pdf

¹¹⁹ HHS ASPR. 2012 HHS Public Health Emergency Medical Countermeasures. 2012

<http://www.phe.gov/Preparedness/mcm/phemce/Documents/2012-PHEMCE-Strategy.pdf>

robust manufacturing, better stockpiling, and more advanced distribution practices... we want to create a system that can respond to any threat at any time.”¹²⁰ The efforts of the United States to address the seriousness of being unprepared for a medical emergency due to infectious diseases are in line with the defensive practice of vaccinating the military and pushing our civilian society to have preemptive immunity.

Andrew Artenstein provides a comprehensive study on the efforts to vaccinate the U.S. military in order to protect soldiers against some of the most deadly and virulent diseases. He points out that disease prevention has been a large part of military readiness dating back to the Continental Army during the American Revolution.¹²¹ Artenstein also admits that there are a variety of infectious threats and diseases that face military forces, such as malaria that continues to pose a public health problem for many deployed in areas of the world where malaria is prevalent. Yet, Artenstein encourages the use and further development of vaccinations that will boost immunity in the military.¹²²

Artenstein is not alone in this point of view. Many believe that the development and implementation of vaccination programs are the most important medical contribution to global and public health. Hassani, Patel, and Pirofski agree that vaccination-based strategies for increasing immunity are highly effective. However, Hassani et al. provide counterpoints to the notion of relying solely on vaccination as the main defense against bioweapon attacks. They provide four uncertainties around vaccination strategies to combat bioweapons and disease prevalence: First, the lack of a vaccine’s availability; Second, the uncertain safety and effectiveness of a vaccine; Third, the vaccine may not

¹²⁰ HHS ASPRhe Public Health Emergency Medical Countermeasures Enterprise Review: 2010 <https://www.medicalcountermeasures.gov/media/1138/mcmreviewfinalcover-508.pdf>

¹²¹ Artenstein, Andrew W. *Vaccines: A Biography*. New York, NY: Springer Science+Business Media, LLC, 2010.

¹²² *Ibid*, p. 21

work on large proportions of the general population, i.e., immunocompromised individuals, children, and the elderly; Fourth, vaccines are subject to intellectual property and creation and development are often kept secret.¹²³

Dr. Amesh Adalja strongly discourages against relying on current vaccination strategy to combat infectious disease for several reasons and states that vaccinations are not a panacea. He suggests that vaccinations and immunity to a disease often requires a series of inoculations in order to be the most effective; stating the need for continual booster shots for many infectious diseases such as, hepatitis B. Adalja also points out that vaccination and inoculation is a personal or parental decision that creates vulnerabilities not only in the individuals that don't choose to be inoculated, but also to populations too young to be vaccinated or immunocompromised individuals. He warns that there are limits to vaccinations that could cause dangerous epidemics.¹²⁴

Another argument against running to antivirals and antibiotics is that they too can become ineffective against their counterparts. Much like the process that creates immunity in human biology, this process of immunity is also replicated in many microbes from harmless intestinal bacteria to "superbugs." It is known that bacteria evolve quickly and adapt to antibiotics used to threaten their existence. Therefore, the increased use of antibiotics will only increase the strength and drug-resistant qualities of dangerous germs.¹²⁵ As Lee, Siddiqui, and Khan have observed, the advancements in new antibiotic drugs led to their overuse and the creation of drug resistant bacteria. However, there are

¹²³ Hassani, M., Patel, M.C., Pirofski, L.-A. Vaccines for the prevention of diseases caused by potential bioweapons (2004) *Clinical Immunology*, 111 (1), pp. 11.

¹²⁴ Amesh A. Adalja. "Vaccines, Immunity, Whooping Cough, and Mumps." *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*. (March 2011),

¹²⁵ McKay, B. "U.S. News: Losing Ground in War on Bugs --- Millions Each Year Develop Infections Resistant to Antibiotics, Report Finds. *Wall Street Journal*. (2013, Sep 17)

also increases in drug-resistant bacteria that have traditionally been treatable. Researchers in Italy identified strains of *Mycobacterium tuberculosis* (TB) that are resistant to well-known TB treatments that have been spread by migrants coming from countries with high prevalence of TB. These cases require treatments that are more toxic and expensive to treat without a guarantee of effectiveness or safety.¹²⁶ This gets even more complicated when infected individuals enter into populations where the disease has been eradicated and is rarely inoculated for the reemerging disease.

Human migration and disease propagation has always posed a threat to countries. The United States understood this relationship early on and quarantine was an official practice used on many sick immigrants coming into the country. In 1878, Congress passed the National Quarantine Act to prevent the introduction of infectious diseases into the United States. This act was in response to a yellow fever outbreak that had thousands of immigrants looking for a safer place. However, the act gave greater authority to Marine Hospital Service to quarantine ships that were carrying passengers with communicable diseases. The Quarantine Act along with the Immigration Act of 1891 denied immigrants entry into the United States, who had dangerous and contagious diseases, keeping the American public safe from a possible pandemic.

Recently, with the Ebola epidemic in Africa and its slow spread to other countries, the United States issued airport screenings with a potential for quarantine if an individual showed symptoms of the disease. However, this recent Ebola outbreak has demonstrated the benefits of a secure and efficient public health system and has highlighted the health disparity between a developed nation and underdeveloped nation.

¹²⁶ F. MIGNONE, L. R. CODECASA, C. SCOLFARO, I. RAFFALDI, L. LANCELLA, M. FERRARESE, S. GARAZZINO, C. MARABOTTO, S. ESPOSITO, C. GABIANO, R. LIPRERI and P.-A. TOVO (2014). The spread of drug-resistant tuberculosis in children: an Italian case series. *Epidemiology and Infection*, 142, pp 2049-2056.

For example the only known experimental vaccine for *Ebolavirus* (EBOV) was developed and manufactured by a company in San Diego, California and was used on two American doctors, who recovered and are said to have built up antibodies that neutralizes the virus and are immune to EBOV.¹²⁷ Given the 90 percent fatality rate for infected individuals in Africa without the experimental vaccine, it's important to understand that the two American doctors could potentially become host reservoirs for EBOV and could potentially spread the virus, much like any infectious disease. Immunity is only beneficial to those that have immunity to a prevalent and present disease and that immunity comes with a market value for everyone else.

Stewart Patrick explains that national security threats from weak and failing states have a spillover effect on the United States.¹²⁸ These weak states have an impact on international order and much like terrorism, infectious diseases can cause widespread insecurity and international problems. However, what can immunity do to strengthen vulnerabilities or how can immunity help a state's adversaries gain strategic positioning on a disputed border or territory?

Although SARS is a communicable disease that has real and immediate impacts on health, the economic impact on China's foreign investment was just as damaging and provided a strategic advantage for other economic competitors. The economic loss to China was estimated to be roughly \$40 billion and could be higher if investors remained

¹²⁷ Gholipour, Bahar. "American Ebola Survivors Are likely Immune to Virus Strain Now." Live Science. <http://www.livescience.com/47511-are-ebola-survivors-immune.html>

¹²⁸ Patrick, Stewart. 2006. "Weak States and Global Threats: Fact or Fiction?." Washington Quarterly 29, no. 2: p.28

uncertain about China's abilities to manage other public health emergencies.¹²⁹ U.S. fears about Chinese economic power were soon eased in light of China's economic loss due to their inability to effectively manage an epidemic, which the United States managed seamlessly. The United States contributed over 800 staff members from the Center for Disease Control to assist in the containment effort.¹³⁰

Immunity to infectious diseases and the research to discover and counter emerging infectious disease has become a big business due to the national security implications of not fighting these diseases. However, the question still remains as to whether immunity is in fact, a passive biological weapon and if the race to increase immunity is masked by a dual-use function? Additionally, are efforts to develop and protect populations from diseases altruistic and humanitarian or are they a strategic in securing power and influence. Whereas immunity in the past was gained over time in a population, today immunity can go to the highest bidder. This has been exemplified in the recent outbreak of the Ebola virus where the death rate is at 70 percent for those infected in West Africa, yet in the U.S. it is 11 percent.¹³¹

Methodology

The method used to examine whether efforts to develop immunity to disease advance national and international security or insecurity and the degree immunity can become a weapon of mass destruction will consist of an analysis of historical epidemics

¹²⁹ Knobler, S. [et al.], editors. Learning from SARS : preparing for the next disease outbreak : workshop summary. Forum on Microbial Threats, Board on Global Health. (2004)

<http://www.ncbi.nlm.nih.gov/books/NBK92462/pdf/TOC.pdf>

¹³⁰ Ibid. p.13 <http://www.ncbi.nlm.nih.gov/books/NBK92462/pdf/TOC.pdf>

¹³¹ The number was calculated by the WHO by taking the number of Ebola cases divided by the number of people that have died due to the virus. I applied the same calculation to the one death in the U.S. verses its 9 survivors or recovered cases specifically, 2 contracted in the U.S., 4 diagnosed in the U.S. and 5 evacuated to the U.S. from other countries. Epatko, L. "70 Percent Ebola Death Rate? Here's How They Calculate It." Newshour, PBS. Oct. 2014. <http://www.pbs.org/newshour/rundown/70-percent-ebola-death-rate-calculate/>

and their impact on a state, its population, and its geopolitical influence. A literature review of medical countermeasures development and the arguments around vaccinations and immunity identified various themes and key questions in examining how efforts to develop immunity to diseases advance national and international security or insecurity? Additionally, by reviewing western expansion and European colonial history it also revealed questions on whether or not immunity to virulent, communicable diseases can be used as a weapon of mass casualty and disruption to further power and influence. These themes will assist in examining several case studies to assist in addressing these questions. Examining the Spanish exploration and evasion of Mesoamerica and the American annexation of the Kingdom of Hawai'i will provide rich context to understanding the role immunity and disease play in geopolitics and power.

In addition, to examining these historical cases, this study will also examine the current state of affairs in immunity and disease prevalence around the world using the World Health Organization's Global Health Estimates.¹³² These measures will provide a quantitative reference to gauging health security in a given state as it relates to vaccine rates for polio, HepB, and measles. By taking the average of the three vaccine rates, it will provide the state with a vaccine coverage percentage that will give an indication of state immunity. Comparing this data with the Fragile State Index provided by the Fund for Peace, which factors 12 categories for measuring the level of states stability will allow for a complete analysis of the role health plays in geopolitics and instability.¹³³

¹³² WHO. Global Health Estimates (GHE). Nov.2014.

http://www.who.int/healthinfo/global_burden_disease/en/

¹³³ Fund for Peace. Failed States Index 5-Year Trends, 2008-2013. Nov.2014. <http://ffp.statesindex.org/fsi-trends-2013>

Case Studies

According to the World Health Organization's (WHO) Global Health Estimates immunizations helps to prevent 2-3 million deaths a year from many common infectious diseases. Without immunization many of the weak and fragile states would suffer severe strains on their economy, public safety and social society. In 2008, the WHO estimated 8.8 million children, under the age of five years, dies from diseases preventable with a vaccination.¹³⁴ The future development of countries depends on the ability to care for their populous and maintain a healthy level of immunity. In 2013, there were three polio-endemic countries, opposed to 125 in 1998.¹³⁵ These three endemic-countries; Afghanistan, Pakistan, and Somalia were also three of the top ten fragile states identified by the Fund for Peace. The Fragile State report compiles data on 12 categories that provide each state a score of progress or regression. Given the information regarding the fragile nature of these countries coupled with a lack of immunity against communicable diseases it is likely that their geopolitical security is at risk.¹³⁶ Drawing on lessons learned from historical pandemics and their impact on geopolitics and security, it is important that these countries provide higher rates of vaccinations or they could be in serious danger when a pandemic emerges to repeat history. Violent non-state actors (VNSA) and region rivals may take advantage of these fragile states' poor public health infrastructure and vulnerable population by releasing a bioweapon or introducing a disease that they are already immune to. Figure 1 shows the vaccine rates for polio, measles, and Hepatitis B for the top ten most fragile states. Additionally, the United

¹³⁴ World Health Organization. Global Immunization Data. July 2014.

http://www.who.int/immunization/monitoring_surveillance/global_immunization_data.pdf

¹³⁵ Ibid. pg3

¹³⁶ Fund for Peace. Failed States Index 5-Year Trends, 2008-2013. Nov.2014. <http://ffp.statesindex.org/fsi-trends-2013>

States is added for a comparative look at the vaccination and immunization percentage.

Figure 1. Coverage Percentages for the Top Ten Fragile States

Country	Measles	HepB (infant)	Polio	Coverage
South Sudan	55	NA	56	36%
Somalia	29	34	24	29%
Central African Rep.	29	28	28	28%
Congo (D. R.)	80	87	85	84%
Sudan	85	93	93	90%
Chad	79	80	80	79%
Afghanistan	82	90	90	87%
Yemen	78	88	88	84%
Haiti	80	85	92	86%
Pakistan	61	66	66	64%
United States	91	90	93	91%

Source: table developed by author with data from FFP states index and WHO

According to figure 1, South Sudan tops the chart for most fragile state as well as has the lowest immunization rate among these states. Given the territorial dispute with The Sudan, South Sudan is extremely vulnerable to losing their population to infectious disease that The Sudan is immune to. Constant engagement between these two countries could wreak havoc on the South Sudanese people. Lessons from the Spanish flu in 1918-1919, teach us that infectious diseases inflict everyone and have the power to alter the outcome of a conflict. Many historians believe that the Spanish flu was responsible for

the speedy conclusion to WWI.¹³⁷ However, the outcome could have been very different if immunity was monopolized by one side of the conflict. The Sudan enjoys a 90 percent immunization rate, a rate much higher than South Sudan and this could alter the outcome of future disputes in that region.

The subsequent case studies on the immunity of a nation and the correlation to its failed attempts to maintain power over its territory and people should provide a clearer insight to the question as to whether or not immunity can be used as a passive weapon of mass destruction. The intentional or unintentional exposure of infectious diseases to unimmunized societies had a severe impact on the native populations of the Pacific and the American continent. These societies offered prospects of wealth and power to foreign occupiers, who could overcome the indigenous power. The task to overthrow these societies on military and man power alone posed several unique problems; 1) geographical isolation, meant that occupiers had to travel long distances to arrive to these areas, 2) established and numerous native populations, meant they could easily outnumber their foreign occupiers, 3) limited supplies, the occupiers had little to use, whereas the natives knew their land and had everything they needed to fight, 4) time, the native populations were not on a time schedule and could fight until the occupiers were gone. The occupiers were either under order from their governments or at the mercy of budgets that had real time implications; 5) established hierarchical society, the native society was well established with legitimate governance. It would have been difficult for occupiers to replace it though brute force and subjugation. Therefore, the foreign occupiers needed something to assist in getting rid of these problems. Unintentionally,

¹³⁷ GrrlScientist. *Influenza: How the Great War helped create the greatest pandemic ever known*. The Guardian, 30 July 2014. <http://www.theguardian.com/science/grrlscientist/2014/jul/30/influenza-pandemic-1918-viruses-biology-medicine-history>

they had the solution with them.

Disease in the Kingdom of Hawai'i

Hawai'i is not usually the first place people think of when deadly infectious diseases and plagues are mentioned. However, much like many colonized isolated areas in the world throughout history, Hawai'i was no exception to the death and destruction from viruses brought by foreign visitors to the islands. The Hawaiians' battle with these illnesses as they battled land grabs by the American government and foreign businessmen, which led to an inevitable decline in population, power and legitimacy.

In 1778, during the time Captain Cook arrived in the Hawaiian Islands, there were approximately 800,000 native Hawaiians and a formalized governance structure in the form of a monarchy. From the time of Cook's arrival to 1820 the native Hawaiian population had decrease to 135,000, a decline attributed to the Hawaiian's lack of immunity to many of the infectious diseases brought by the foreign visitors, which they had been immune.¹³⁸ Additionally, King Kahmehameha II along with his wife, Queen Kamamalu and several others in his royal court died of measles on their visit to London, England because none of them had immunity to the disease.¹³⁹ Their death and the decline in the native population led to several advantages for foreign dominance. The first advantage was that political legitimacy was in question. Due to the foreigners' immunity to sickness, many native Hawaiians viewed them as immortal and believed they were gods. This checked the power of native religion and the monarchy. Secondly, the population was a fraction of what it was. This had enormous impacts on villages and

¹³⁸ LANGER, ELINOR. 2008. "FAMOUS ARE THE FLOWERS. (cover story)." *Nation*, April 28. 15.

¹³⁹ Theophilus Harris Davies (July 26, 1889). "The last hours of Liholiho and Kamamalu: a letter sent to H.R.H. Princess Liliuokalani presented to the Hawaiian Historical Society". *Annual report of the Hawaiian Historical Society 1897*. pp. 30–32.

the governance structure in the islands. There is strength in numbers and the natives saw their strength dwindle with their numbers. In 1898, a little more than one hundred years from the arrival of Captain Cook and Christian missionaries the native Hawaiian population was around 40,000, including individuals that had at least 50 percent native Hawaiian heritage.¹⁴⁰ By the time the United States decided to move toward an act of war against the Kingdom of Hawai'i and annex the independent nation, the people and their monarch were decimated by illness. Migrants from China, the Philippines, Japan and the United States outnumbered the native Hawaiian population. The monarch was no longer supported and could not control the population.

Although there are many factors that contributed to the decline of Hawaiian power and the increase in foreign influence. The lack of immunity to diseases brought by Europeans and Americans had the most devastating impact on the health of the Hawaiian people, Hawaiian socio-political structure, and the security of their country. As more Hawaiians died, land ownership by natives decreased and left more lands to be bought and sold to companies and foreigners-- giving Hawaiians less rights and foreign land owners more opportunity and power.¹⁴¹ Immunity to sickness gave white foreigners more power and influence over the Hawaiian economy and inevitably the power to overthrow the government. Had the native Hawaiians had the immunity to fight off measles and common illnesses then history would be telling us a different story. The Hawaiian population would have flourished amid the economic boom in sugar and the monarch would have maintained political legitimacy in the face of foreign aggressors by collecting larger tax revenues. The unintentional consequences of their immunity to

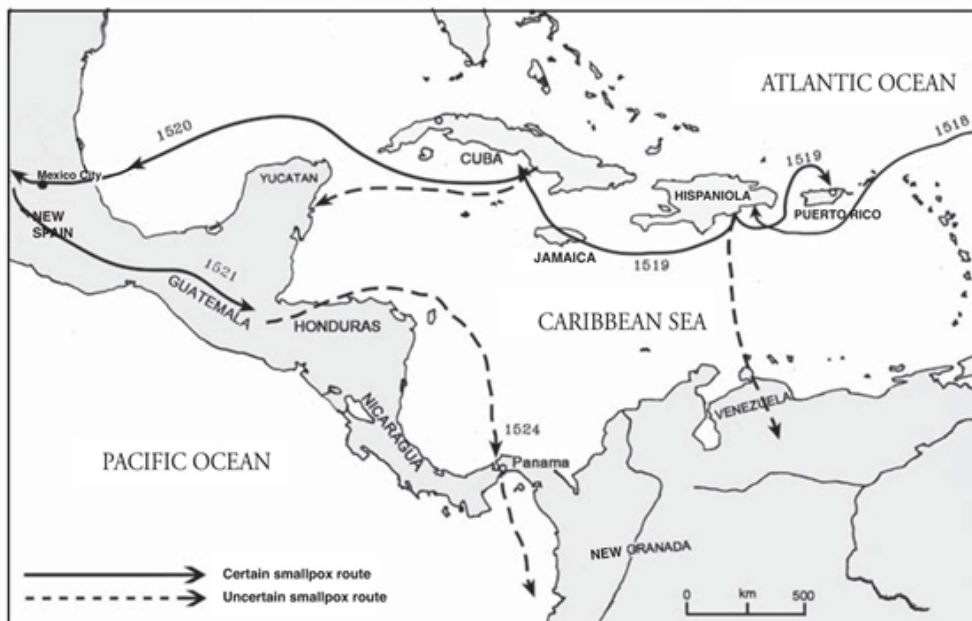
¹⁴⁰ Langor. p3

¹⁴¹ Banner, Stuart. "Preparing to Be Colonized: Land Tenure and Legal Strategy in Nineteenth-Century Hawaii." *Law & Society Review* 39, no. 2 (June 2005): 273-314. P.277

infectious disease led to their ultimate take-over. Without the power of immunity, the European and American foreigners would not have seemed immortal in the midst of a pandemic.

The Conquistador's Epidemic

Figure 2. The First Smallpox Epidemic in the New World



Source: Population & Development Review, Jun2006, Vol. 32 Issue 2, p199-232, 34p, 4 Charts, 1 Map Map; found on p. 214

In the spring of 1519, Spanish Captain Hernando Cortes arrived on the eastern coast of Mexico. He arrived to a land inhabited by an estimated 22 million indigenous people. Cortes had roughly 600 soldiers at his side to fight and defend himself if necessary.¹⁴² Severely outnumbered, Cortes tried his luck in challenging Montezuma by recruiting native allies and exploiting the weak allegiances to Montezuma and the capitol city. He employed roughly 1,000 warriors to help him fight. Still extremely

¹⁴² Mee, Charles L. "That fateful moment when two civilizations came face to face." *Smithsonian* 23, (October 1992): 56

outnumbered, Cortes' luck changed on May of 1520 when another Spanish fleet arrived with 900 more Spanish soldiers and a slave with smallpox. Although, the native population had put up a good fight against Cortes and banded together to defeat the Spanish. They were soon overwhelmed by the amount of death caused by smallpox and other newly introduced diseases. Although, the fighting had ended with the native population decimated and a new foreign power in control the destruction from the smallpox virus continued to scourge the countryside. An approximate 20 million died of the original 22 million indigenous inhabitants.¹⁴³ In a little less than seven years the Spanish had conquered an ancient civilization and admit that it was of no might of their own besides the fact that they introduced the smallpox virus to the Aztec people, who had never been exposed to it before.¹⁴⁴

Spain gained an immense amount of territory as part of their New World conquest. Unfortunately, the depleted native population, which allowed them to gain more territory, left the Spanish settlers with the necessary labor they needed to mine gold and silver and work in sugar plantations. However, the colonization of the Americas was overall profitable to the Spanish Empire. So much so that the period between the 16th and 17th is commonly referred to as "The Golden Age of Spain."¹⁴⁵ Yet, their claim to victory was the native's lack of immunity to the smallpox virus.

In the case of the fall of the Aztec civilization and Spanish dominance, there are several reason that could have aided in Spanish conquest, sans a deadly infectious disease; 1) the political alliances in the Aztec Empire were volatile and many natives

¹⁴³ Ibid. p.59

¹⁴⁴ Stutz, Bruce. "Megadeath in Mexico." *Discover* 27, no. 2 (February 2006): 44-51.

¹⁴⁵ The Latin Library. "The Spanish Empire."

<http://www.thelatinlibrary.com/imperialism/notes/spanishempire.html>

sought alliance with the Spanish to overthrow Montezuma's rule, 2) Access to the New World from Spain was not as difficult, 3) the Spanish were so technologically advanced in weapons and warfare that they would have been able to overcome the native populace. Yet, the Spanish increased their chances 90 percent with the death of 20 million unimmunized Aztecs.

Shortly after the fall of the Aztec Empire, the Inca Empire followed in the same footsteps. In 1525, Spanish explorers set out to verify rumors of the immense wealth of gold and silver of the Incas. When they arrived they found themselves in the midst of a civil war between the two surviving sons of the late Incan Emperor, this allowed the Spanish access to eventually kill the victor along with approximately one million Incas. However, the Spanish explorers that pillaged the Inca Empire did not have the manpower to fight the Inca warriors, instead they also had help from the smallpox virus that raged through the existing Inca population after their bloody civil war.¹⁴⁶ The lack of immunity to the infectious smallpox virus meant the death of the Inca Empire, culture and power. The smallpox virus assisted the Spanish in the death and destruction of ancient civilizations that otherwise would have continued.

The devastating effect on infectious diseases on the indigenous people of Hawaii and the Americas was exacerbated by the lack of immunity to the newly introduced virus many Europeans and Americans had immunity to. Had the Europeans and Americans lacked immunity to the deadly diseases they would not have been able to leverage the losses to measles and smallpox on the native populations. Due to the drastic impacts on these populations the foreign occupiers capitalized on the access to new labor, trade, and

¹⁴⁶ Thomson, Mark. "The migration of smallpox and its indelible footprint on Latin American history." *History Teacher* 32, no. 1 (November 1998): 117-131.

raw materials. Immunity gave them the ability to continue their affairs as the native populations decrease around them. These three examples of the role immunity played in the shift of power epitomize the unintentional consequences of dual-use medical countermeasures and the moral dilemma to immune some and withhold it from others. Therefore, the questions remains, does immunity create intentional strategic positioning? Can the increase in vaccine production of endemic viruses in developed nations pose an unintentional problem for unimmunized societies in the modern world? The previous case studies illustrate the geo-political advances of an immune population and the mass casualty of a passive biological agent.

Conclusion

From the previously presented information it is apparent that immunity to virulent, communicable diseases can be used as a weapon of mass casualty and disruption. However, does immunity create intentional strategic positioning and can the increase in vaccine production of endemic viruses in developed nations pose an unintentional problem for unimmunized societies in the modern world? The lessons learned from the case studies provide an idea of the strategic role immunity of deadly viruses and infectious diseases can have on developing or emerging societies. Additionally, by examining vaccination coverage rates from the World Health Organization in the top ten most fragile states according to the Fund for Peace's Fragile State Index, we can draw a conclusion as to the vulnerability states have that don't have high rates of immunization to some of the world's most endemic infectious diseases namely; measles, HepB, and polio.

Drawing on the history and lessons learned from the Kingdom of Hawai'i and the Aztec and Incan Empires, these identified countries with low vaccination rates may be at further risk of losing their power or geo-political standing if they are subject to a regional rival that has sufficient immunity to various infectious diseases. The current Ebola virus pandemic has tested these notions of vaccine development, testing, and international intervention. The disparity between rich developed nations and their ability to vaccinate their populations against virulent infectious disease and those developing countries that don't-- is exacerbated during international epidemics. The death rate of Western African countries and their inability to contain the virus will have extreme geopolitical and economic impacts for many years to come. Similar to the historical cases, the economic and political gain from their loss is reserved for those with the most immunity.

It is clear that the race to vaccinate large portions of a country's population is a defense mechanism, not only against sickness, but the possible decline of a nation. As public health and national security intersect, the medical advances made by some countries could be used as a biological defense against others. Immunity will become a passive biological weapon, threatening those who are not immune. The danger in defensive immunity is that it leaves people out of the vaccination loop. These left out are already vulnerable and insecure. The creation of vaccines and the development of isolated immunity could potentially create a host or reservoir population for a superbug. Therefore, when that population exposes another unexposed population to this superbug, the outcome could be devastating, repeating the historical examples.

Although as noted previously there are many factors that contributed to the vulnerability of the native populations in Hawai'i and the New World, but nothing

assisted the Europeans and Americans get an advantage like the infectious disease they had been immune to. The Europeans and Americans had technology and sophisticated weapons along with western civilization, but even those resources could not have depleted the populations so much to the point of submission. The defensive use of biotechnology to protect people from sickness is a necessary function of health security. Yet, the proliferation of bioagents to defensively create a countermeasure is excessive and dangerous. This type of research skips the natural evolution of immunity, a symbiotic relationship humans have had with their natural environment. In the case of the indigenous populations fighting a foreign disease, the artificial development of antivirals can also cause an epidemiological problem by introducing new infectious diseases unknown to man. As the developed world works toward super immunity only time will tell how their geopolitical influence will change due to it. However, it has been shown that immunity can be used as a weapon of mass casualty to advance political and economic gain; it is a bioweapon that epitomizes the dual-use designation.

Conclusion

The examination of various themes and issues within biodefense and biosecurity are complex and deserve a more predominate place in the national security sphere. As technology, warfare, and health intersect the issues previously examined in this thesis will be further highlighted and become a major concern for states' development and safety. Illness has always existed as a part of human life. Buddhist philosophy categorizes sickness as one of the four noble truths, an unescapable reality of life, along with birth, aging and death. Therefore, efforts to mitigate deadly bacteria and viruses' effects on the human condition and provide a better quality of life for those suffering is a noble practice. However, it is the reality that violent non-state actors and rogue states are going to try to use whatever they can to inflict pain and death on those they oppose. The reality of biological weapons is that they are non-discriminatory, they will inflict everyone and anyone, and even those that intend to harm others with them. This simple truth is the very reasons why biodefense has dual-use capabilities that make necessary medical countermeasures appear to proliferate deadly infectious diseases. Yet, as mentioned before, these efforts are dual-use regardless of the intention behind their creation. Although, the world has yet to see a large scale biological weapons attack or secured universal biosurveillance, as long as there is sickness, there will be need for a countermeasure.

Chapter One explored the Amerithrax attack of 2001 where, seven letters containing weapons grade anthrax was delivered to two Senate offices and five major news media outlets. These seven letters contaminated multiple facilities that cost the United States approximately \$6 billion in damages and five individuals their lives. The

psychological impact of this attack still guides policy and drives the justification for biodefense expansion. Security measures have been introduced and suggested far beyond the scope that this incident evolved. During fiscal year 2010 to 2011 the United States spent roughly \$879 billion on biodefense for the Department of Homeland Security and \$663 billion in the form of countermeasure research and development.

The conclusion of this chapter found that biodefense research and development on medical countermeasures is a strategy that creates the greatest insecurity. The equation presented in Chapter One suggested that an increase in any of the strategy measures contributed to an increase in biodefense and subsequently increased national security regardless of what that strategy measure was. This is flawed based on the observation that medical countermeasures proliferate dangerous pathogens at the risk of causing a pandemic or encouraging other states to counter others' medical countermeasures' research, which create secret biodefense programs that can't be monitored. From the case study we saw that not all biodefense strategies are created equally and that it is too simplistic to declare biodefense causes insecurity. Many factors were presented that make up biodefense and the various outcomes each has. Yet, there are particular strategies that multiply threats and others that are truly defensive in nature. The Amerithrax, 2001 Anthrax Letters provide a great narrative for explaining this complex relationship for at least two reasons. One, the case is still inconclusive due to many of the reasons that make biological weapons very dangerous and two, the impact it had on national security spending in biodefense.

Through the analysis in Chapter One, it is conclusive that proliferating biological weapons for the sake of defensive strategies is not the path toward security.

Governments should work together to bring biodefense programs out of obscurity and secrecy. The dual-use dilemma of biodefense is due to states dishonest practices and misrepresenting their intentions. Once governments reveal the true nature of biodefense by actually engaging in measures that will defend, like investing in personal protection equipment, biosurveillance, intelligence collection and analysis, and invest in public preparedness and response, we will be in a better position to counter dual-use capabilities.

Chapter One illustrated that we are less secure with the current biodefense strategy. Its effectiveness has not been proven and the chapter has explained that the United States is promoting biodefense strategies that are creating insecurity and are not effective defensive strategies and that these strategies appear to make things easier for VNSAs or rogue states to use a biological weapon.

However, this study concludes that biological agents are complex organisms that require advanced understanding of biotechnology and engineering to effectively weaponize them into a weapon of mass destruction and this understanding is currently beyond the advancements of modern biotechnology and modern terrorist groups and VNSA motivation. Chapter Two explains that terrorists are technologically challenged and weigh weapons complexity against impact, expecting guaranteed high impact results for increasingly technical complex weapons.

Furthermore, terrorist organizational structure and methods of operation determine the capability and motives for investing time and resources into technologically complex weapons and very few groups that have the capabilities and resources are not motivated enough to use biological weapons. Conversely, those groups

that have the motivation to use biological weapons do not have the means. Therefore, the union between terrorism and biological weapons is an unhappy and dysfunctional relationship. The current assumptions on bioterrorism as we understand it does not suit the group or the weapon and this is the main reason why the United States has not experienced a large scale, biological weapons attack by a violent non-state actor in the post WWII era.

Chapter Two examines many variables that could be included to answer, why the United States has not experienced a large scale, biological weapons attack by a violent non-state actor in the post WWII era? Although, the study could be more comprehensive in referencing various efforts to mitigate the possibilities of violent non-states actors' abilities to acquire or use biological weapons, it showcases the profiles of those willing to use a biological weapon and their motives. Yet, Chapter Two provides a clear case that adequately shows, the United States is safe from a large-scale bioterrorism attack until highly motivated, organized terrorists expect less impact for their effort.

Even if a bioterrorist wanted to inflict mass casualty on a population it is not clear that it would do that much damage. The United States' ability to counter infectious diseases through a multitude of non-pharmaceutical interventions and vaccinations is a testament to U.S. biosecurity strategy and overall immunity. Chapter Three examined the natural defense and the medical countermeasures we rely on the support those natural defense systems.

Finally, Chapter Three questioned immunity's intentional strategic positioning and how the increase in vaccine production of endemic viruses in developed nations pose an unintentional problem for unimmunized societies in the modern world. The lessons

learned from the case studies provided an idea of the strategic role immunity of deadly viruses and infectious diseases can have on developing or emerging societies.

Additionally, by examining vaccination coverage rates from the World Health Organization in the top ten most fragile states, we drew a conclusion that vulnerable states that don't have high rates of immunization to some of the world's most endemic infectious diseases namely; measles, HepB, and polio are at great risk for decline regionally and possibly face political extinction.

Lessons learned from the historical case studies-- Kingdom of Hawai'i and the Aztec and Incan Empires, these identified countries with low vaccination rates may be at further risk of losing their power or geo-political standing if they are subject to a regional rival that has sufficient immunity to various infectious diseases. The disparity between rich developed nations and their ability to vaccinate their populations against virulent infectious disease and those developing countries that don't-- is exacerbated during international epidemics. The death rate of Western African countries and their inability to contain the virus will have extreme geopolitical and economic impacts for many years to come. Similar to the historical cases, the economic and political gain from their loss is reserved for those with the most immunity.

It is clear that the race to vaccinate large portions of a country's population is a defense mechanism, not only against sickness, but the possible decline of a nation. As public health and national security intersect, the medical advances made by some countries could be used as a biological defense against others. Immunity will become a passive biological weapon, threatening those who are not immune. The danger in defensive immunity is that it leaves people out of the vaccination loop. These left out are

already vulnerable and insecure. The creation of vaccines and the development of isolated immunity could potentially create a host or reservoir population for a superbug. Therefore, when that population exposes another unexposed population to this superbug, the outcome could be devastating, repeating the historical examples.

Although as noted previously there are many factors that contributed to the vulnerability of the native populations in Hawai'i and the New World, but nothing assisted the Europeans and Americans get an advantage like the infectious disease they had been immune to. The Europeans and Americans had technology and sophisticated weapons along with western civilization, but even those resources could not have depleted the populations so much to the point of submission. The defensive use of biotechnology to protect people from sickness is a necessary function of health security. Yet, the proliferation of bioagents to defensively create a countermeasure is excessive and dangerous. This type of research skips the natural evolution of immunity, a symbiotic relationship humans have had with their natural environment. In the case of the indigenous populations fighting a foreign disease, the artificial development of antivirals can also cause an epidemiological problem by introducing new infectious diseases unknown to man. As the developed world works toward super immunity only time will tell how their geopolitical influence will change due to it. However, it has been shown that immunity can be used as a weapon of mass casualty to advance political and economic gain; it is a bioweapon that epitomizes the dual-use designation.

Throughout this thesis the overarching theme is that we are making biological weapons more virulent, more accessible, and diverse. The advancements in technology continue to stretch the limits of security and the possibilities for bioagents use. Through

these various studies on biosecurity and biodefense more needs to be done to educate the public on symptoms, non-pharmaceutical interventions, and natural defense strengthening. The medical countermeasure production is creating opportunities for superbugs and proliferating potential deadly diseases. Overall, biosecurity should focus on community mitigation and the goal for biotechnology should focus on the greater good not the value of a vaccine.

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Curriculum Vitae

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PROFESSIONAL EXPERIENCE

Management Analyst II

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Office of Policy and Planning

Washington, DC

01/2014 - Present

- Support the Division of Policy and Strategic Planning in executing its project leadership and management activities as it relates to public health response, situation awareness, community resilience and preparedness.
- Tracking and monitoring all deliverables, organize files and other written/electronic materials. Evaluate program and projects to cost, schedule and performance requirements. Evaluate management controls, strategic business plan, and other measures and metrics.
- Assist in strategic planning, prepare communications materials, including but not limited to written communications (brochures, newsletters, etc.); website development; ghost writing, posters, working with federal staff.

Policy Associate

Asian & Pacific Islander American Health Forum (APIAHF)

Washington, DC

01/2011 – 01/2014

- Design, edit, and write reports, factsheets, advocacy tool-kits, and federal comments for public distribution and consumption on language access, data collection, data disaggregation, and health disparities in communities of color. Analyze and monitor federal legislation and regulatory changes regarding public health policy impacting Asian American, Native Hawaiian and Pacific Islander communities.
- Work with local Asian American and Pacific Islander organizations to advocate local, state and federal policymakers on a variety of issues as they relate to health by providing technical assistance, press release templates and social media support. Organize and coordinate advocacy days by scheduling appointments, and developing issue briefs, talking points and informational leave-behind packets. Conduct advocacy and lobbying training for community organizations and grantees.
- Acts as a liaison for the organization with the Department of Health and Human Services and the Office of Minority Health to coordinate on key policy priorities and collaborate on programs. Work with other partner organizations, community members, and congressional offices to compile and coordinate the Health Equity and Accountability Act of 2011, introduced in the House and Senate. Assisted in the development of an amicus

brief to the U.S. Supreme Court in support of the Affordable Care Act. Represent APIAHF at various coalition meetings, working groups, receptions and conferences.

- Presented at the American Diabetes Association and American Public Health Association conferences on the health status of Compact of Free Association migrants and health disparities in Pacific Islander communities in the United States. Wrote and submitted a report for publication on Medicaid parity for Compact of Free Association migrants. Contributed to and edited a joint report on Health Information Technology.

Assistant to Principal/Program Associate

Campaign Communications Solutions/Stones' Phones

Washington, DC

04/2010 – 01/2010

- Wrote and edited business proposals and phone scripts for democratic candidates, incumbents, and progressive ballot initiatives during the 2010 mid-term election cycle. Provided on-site counsel and consultation during recordings and telephone town halls—innovative and cost effective ways to reach out stakeholders and constituents. Conducted phone banking support and fielded questions for the campaign and candidate.
- Attended political networking and strategizing events with labor unions, party officials, and congressional staff. Assisted in messaging and demographic data analysis. Worked closely with pollsters, media, mail, and principal consultants to coordinate campaign messaging and strategy.
- Interviewed, managed, and organized the company's intern program. Assigned, approved, and supervised intern work load and projects. Organized and prepared presentations for marketing meetings, staff events, and client conference calls. Developed a company ad campaign to generate business and solicit innovative campaign solutions.

Congressional Intern

Congresswoman Susan Davis, CA-53rd

Washington, DC

01/2010 – 03/2010

Congressman Eni Faleomavaega, American Samoa

Washington, DC

06/2009 – 09/2009

U.S. Senator Barbara Boxer

San Diego, CA

08/2008 – 01/2009

- Monitored, compiled, and maintained appropriations portfolio consisting of armed services funding and language requests. Assisted legislative assistants with filing requests and vetting companies and organizations. Developed a database and tracking system. Attended and assisted in preparing the member for hearings, briefings, and bill mark-ups in the Subcommittee on Military Personnel in the House Armed Services Committee.
- Drafted constituent correspondence letters regarding the DREAM Act and health care reform. Worked closely with senior staff to brief the member on talking points for community outreach townhalls and floor speeches. Assisted the press secretary in monitoring local press for news regarding the congresswoman and compiled draft press releases based on researched information.

- Wrote reports on environmental and economic viability of ocean basin mineral mining and geothermal energy in the territory. Wrote and drafted press releases on various topics related to minimum wage, veterans, and natural resources. Assisted in the House Foreign Affairs' Subcommittee on Asia and the Pacific with hearing prep and briefing statements.
- Worked closely with local public officials to secure federal funding for public infrastructure improvements and initiatives. Assisted with writing constituent greetings for local events and ceremonies. Drafted constituent correspondence letters regarding Tiger Grants, immigration, and the Iraq War.

International Trade Researcher
World Trade Center, San Diego

San Diego, CA

08/2006 – 01/2007

- Drafted economic trade profiles of several Pacific Island nations including Samoa, Tonga, Fiji, New Zealand, Papua-New Guinea, and the Solomon Islands. Developed import and export commerce reports on San Diego/Tijuana Region and relationships between Asia and South America. Assisted senior staff with data collection and logistics analysis. Helped client business locate information on customs requirements and laws.
- Provided detailed reports on economic business outlooks for member companies. Researched goods in Europe and Latin America for investor relationships. Created and maintained a company database of various European manufacturing companies to assist with client services.

Representative/Missionary
The Church of Jesus Christ of Latter-Day Saints

Cape Town, South Africa
 Windhoek, Namibia

06/2001 – 02/2003
 02/2003 – 07/2003

- Oversaw an operation of several volunteers engaging in public and community development and service. Coordinated volunteer service opportunities in rural townships and refugee camps. Reported and developed work charts for volunteers teaching English to refugees. Supported a food bank and relief program to needy families in several communities in South Africa and Namibia. Created reports reflecting success and development opportunities in programs. Assisted in clinic support and pharmacy technical support. Provided HIV/AIDS monitoring assistance to rural refugee communities and conducted education programs on infection and transmission. Trained volunteers on cultural sensitivity and competency. Lead several successful community and public relations drives.

SKILLS

Proficient in Microsoft Word, Excel, Power Point, and Outlook; Adobe Acrobat
 Wiki Creation; Drupal CMS, CQ database, RSS feeds; New Media Platforms such as, Twitter and Facebook
 Conversational French and Samoan; Basic Dutch

PUBLICATIONS

Ciammachilli, F. [et al]. "Medicaid Parity for Pacific Migrant Populations in the United States." Harvard Kennedy School of Government, Asian American Policy Review. Vol.24 (2013): 41-51. Print

EDUCATION

Johns Hopkins University
Master of Arts, Global Security Studies Dec 2014
Concentration: Strategic Studies
Thesis: *Biological Weapons: The Black Sheep of the Weapons of Mass Destruction Family*

University of California, San Diego
Bachelor of Arts, Political Science/International Relations June 2008
Minor, Economics
